2020

Sturgeon River Watershed Management Plan

PREPARED BY

Sturgeon River Watershed Alliance

ENDORSEMENTS

The following municipalities accept the *Sturgeon River Watershed Management Plan (2020)* as information and resolve to:

1. continue to work collaboratively with other municipalities and the Sturgeon River Watershed Alliance to implement the plan; and
2. to consider plan recommendations in the decision-making of the municipality including the development of new or updated statutory and other documents.

Municipality	Signature	Position	Date
City of Edmonton			
City of Spruce Grove			
City of St. Albert			
Lac Ste. Anne County			
Parkland County			
Sturgeon County			
Village of Alberta Beach			
Summer Villages of Lac Ste Anne County East (SVLSACE)			
Town of Gibbons			
Town of Morinville			
Town of Onoway			
Town of Stony Plain			

Additionally, the *Sturgeon River Watershed Management Plan* (2020) has been endorsed by the following:

Organization	Signature	Position	Date
Alberta Conservation Association			
Big Lake Environmental Support Society			
North Saskatchewan Watershed Alliance			
Sturgeon River Watershed Alliance			
Wagner Natural Area Society			

EXECUTIVE SUMMARY

In support of *Water for Life: Alberta's strategy for sustainability,* the Sturgeon River Watershed Alliance (SRWA) is a watershed stewardship group made up of communities and organizations operating in the Sturgeon River watershed. The vision of the SRWA is:

> *The Sturgeon River watershed is recognized and valued as a natural prairie river system that connects our communities and adds to our quality of life. It is healthy, sustaining its ecological structure, processes, functions, and resiliency, within its range of natural variability. It is collaboratively stewarded by rural landowners, urban residents and Indigenous communities, and is managed with knowledge and ecological integrity as the foundation for decision-making that balances our social, cultural, economic and environmental well-being.*

To achieve its vision, the SRWA has collected and reviewed existing knowledge about the state of the Sturgeon River watershed, commissioned a number of studies to fill information gaps, and engaged others to better understand values and issues associated with water management in this area. Now, to address the issues identified to date and to guide future actions, the SRWA has developed this *Sturgeon River Watershed Management Plan (2020).* While the plan is a reflection of the SRWA's collective consensus voice, it is presented as information and advice only, with voluntary implementation expected to occur over time, as resources and collaborations allow.

The Sturgeon River is approximately 260 kilometres long. Its headwaters arise from a number of small tributaries and lakes southwest of Lake Isle. The river then runs northeast, flowing through Lake Isle and Lac Ste. Anne, Matchayaw (Devil's) and Big Lakes, St. Albert and Gibbons, before joining the North Saskatchewan River. The Sturgeon River contributes about one percent of the flows of the North Saskatchewan River, which in turn, eventually flow into Hudson's Bay.

The Sturgeon River watershed drains an area of 3,301 square kilometres and includes a number of tributaries, lakes and wetlands. The watershed falls within Treaty 6 Territory and Region 4 of the Métis Nation of Alberta. This area has a rich history and today supports a large agricultural community, as well as a growing urban presence. Unfortunately, the conversion of about 80% of the basin's natural land cover to other land uses has affected the health of the Sturgeon River watershed. Past stakeholder concern saw a number of initiatives to examine or improve watershed health. Concerns also led to the formation of the SRWA in 2014, as well as the development of this watershed management plan to address issues identified in a state of the watershed report produced by the City of St. Albert in 2012.

A watershed management plan puts in place an iterative and adaptive management process with clear goals and performance measures and ongoing monitoring and assessment to ensure goals are met. It is a tool that helps to align and coordinate actions by various players in the watershed. In developing this plan, the SRWA recognizes that water management is complex. In order to discuss different components, the plan is organized around six key outcomes, as follows:

1. **Policies and plans are well-informed and align to support a healthy watershed.**
2. **All residents have access to safe, secure drinking water supplies, whether they are on public or private systems or draw from surface or groundwater.**
3. **Aquatic ecosystems, including our rivers, lakes, wetlands and other water bodies, are healthy.**
4. **The importance of water quantity is recognized and reliable, quality water supplies are available for people, livestock, and a sustainable economy.**
5. **Wise land use ensures the cumulative effects of growth and development are mitigated, the land is resilient to climate change, and individuals and communities are well prepared for flood and drought events.**
6. **Residents and stakeholders support the Sturgeon River Watershed Management Plan and are willing to participate in local and regional initiatives to improve watershed health.**

Each outcome is discussed in more detail in the plan including what is important about each particular topic area, what we know about it, what goals we have set, and what strategies and actions we will use to achieve our goals and outcomes. Priority strategies, to be initiated in the near term, are discussed under plan implementation. The SRWA will report on plan implementation progress annually, and will review, and if necessary, update the plan every five years.

Throughout the development of the plan, SRWA members indicated that the document should also provide a picture of each municipality's efforts within the Sturgeon River watershed. It should also recognize other groups working in the area. Hence throughout this document, a number of 'sidebar' text boxes provide information on individual municipalities, organizations, initiatives and technical reports. Finally, additional information including a list of SRWA members, resources cited, and a ten-year work plan are included in the appendices.

ACKNOWLEDGEMENTS

On behalf of the SRWA Steering Committee, we acknowledge our supporting organizations and thank them for giving us the time to participate on the SRWA, as well as providing logistical support for meetings. We also acknowledge the hard work and dedication of the members of the Technical Advisory Committee and their supporting organizations. We thank the North Saskatchewan Watershed Alliance for their technical and logistical support. We also thank Alberta Environment and Parks and the City of St. Albert for technical and logistical support. In addition to SRWA members, a number of Alberta Environment and Parks staff reviewed the plan or a portion thereof including Lisa Bergen, Cristina Buendia-Fores, Quli Dai, Janine Higgins, Alex Oiffer, Yaw Okyere, Abdi Siad-Omar, Laura Redmond, Stephen Spencer and Vanessa Swarbrick. Finally, we also thank all of the municipal councilors and staff who also reviewed and provided input to this plan and to the SRWA.

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Acronyms and Abbreviations

ACA	Alberta Conservation Association
AEP	Alberta Environment and Parks
AGS	Alberta Geological Survey
ALSA	Alberta Land Stewardship Act
AOPA	Agriculture Operational Practices Act
AUMA	Alberta Urban Municipalities Association
BLESS	Big Lake Environment Support Society
BMP	Best or Beneficial Management Practices
EMRB	Edmonton Metropolitan Region Board
EPEA	Environmental Protection and Enhancement Act
GOA	Government of Alberta
Km or km^2	Kilometre or square kilometre
LID	Low Impact Development
LILSA	Lake Isle and Lac Ste. Anne Water Quality Management Society
LUB	Land Use Bylaw
MDP	Municipal Development Plan
MGA	Municipal Government Act
NSRP	North Saskatchewan Regional Plan (under the Alberta Land Use Framework)
NSWA	North Saskatchewan Watershed Alliance
RMA	Rural Municipalities of Alberta
SC	SRWA Steering Committee
SRWA	Sturgeon River Watershed Alliance
SRWMP	Sturgeon River Watershed Management Plan
TAC	SRWA Technical Advisory Committee
WSG	Watershed Stewardship Group

INTRODUCTION

THE STURGEON RIVER WATERSHED ALLIANCE

In 2003, the Government of Alberta approved *Water for Life: Alberta's Strategy for Sustainability*, a policy that sets the stage for water management in the province. The three goals of the strategy are:

- Safe, secure drinking water supplies
- Healthy aquatic ecosystems
- Reliable, quality water supplies for a sustainable economy

To achieve these goals, *Water for Life* identifies three types of multi-stakeholder partnerships in Alberta: (1) the provincial Alberta Water Council; (2) regional Watershed Planning and Advisory Councils; and (3) Watershed Stewardship Groups (WSG). WSG include a range of local organizations with diverse mandates. These groups undertake actions to raise awareness and/or physically improve their watersheds or local water bodies. As part of these actions, WSGs may also undertake local watershed assessment and management planning activities.

The Sturgeon River Watershed Alliance (SRWA) is a WSG made up of municipalities with jurisdiction in the Sturgeon River watershed. The SRWA is guided by a Steering Committee (SC) of elected municipal officials and a Technical Advisory Committee (TAC) of municipal staff and invited experts. (For a list of SRWA committee members, see Appendix 1.) Additionally, the Government of Alberta (Alberta Environment and Parks), and the regional Watershed Planning and Advisory Council (the North Saskatchewan Watershed Alliance) are also members of both committees. The SRWA also seeks stakeholder input from other levels of government, Indigenous communities, agriculture and industry, conservation groups, academia and the public, through a variety of means such as guest presentations, workshops or forums, and commissioned reports. The vision of the SRWA is as follows:

> *The Sturgeon River watershed is recognized and valued as a natural prairie river system that connects our communities and adds to our quality of life. It is healthy, sustaining its ecological structure, processes, functions, and resiliency, within its range of natural variability. It is collaboratively stewarded by rural landowners, urban residents and Indigenous communities, and is managed with knowledge and ecological integrity as the foundation for decision-making that balances our social, cultural, economic and environmental well-being.*

To achieve this vision, the SRWA has collected and reviewed existing knowledge about the state of the Sturgeon River watershed, commissioned a number of studies to fill information gaps, and engaged others to better understand values and issues associated with water management in this area. Now, to address the issues identified to date and to guide future actions, the SRWA has developed this *Sturgeon River Watershed Management Plan (2020)*.

This plan is a reflection of the SRWA's collective voice, including the watershed issues they have identified and their consensus on a path forward. The plan is also an educational tool, providing the information and rationale to support good decision-making by SRWA members who strive to balance development with environmental protection. That is, the information in this plan can, and has, informed Councilors and municipal staff as they develop statutory and non-statutory municipal tools such as Municipal Development Plans, Land Use Bylaws, Area Structure Plans, Recreation and Environmental plans, map overlays, engineering standards, etc.

"A watershed approach focuses efforts within watersheds, taking into consideration both ground and surface water flow. This approach recognizes and plans for the interaction of land, waters, plants, animals and people. Focusing efforts at the watershed level gives the local watershed community a comprehensive understanding of local management needs, and encourages locally led management decisions."
Water for Life: Alberta's Strategy for Sustainability (2003).

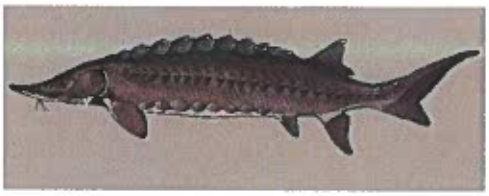
It should be noted, however, that watershed management plans are advisory only, and successful implementation will depend on the continued support and collaboration of the SRWA partners, as time and resources allow. The SRWA also recognizes that different municipalities have different capacities, priorities and commitments. Hence, plan uptake may occur at different rates across the watershed. To address such limitations, every effort will be made by member municipalities to work cooperatively and to leverage watershed management resources where it makes sense to do so. Finally, SRWA members also recognize the need to understand and align this body of work within their own municipal policies and plans, as well as with current water management initiatives and priorities of the Provincial Government.

For more information about the SRWA and its work, including updates on the implementation of this plan, please visit the SRWA webpage.

The Sturgeon River near Gibbons. Credit: D. Trew

THE STURGEON RIVER AND ITS WATERSHED

Approximately 260 kilometres (km) long, the Sturgeon River is a small meandering river in central Alberta with a long history of settlement along its shorelines. Named after a fish of the same name, the river's headwaters arise from a number of small tributaries and lakes (including Hoople and Round Lakes) about 90 km west of Edmonton, in an area west and southwest of Lake Isle (Figure 1).



The Sturgeon River is named after the Lake Sturgeon, a fish species that is now at risk in Alberta. Image: US Fish and Wildlife Service

From its headwaters, the Sturgeon River first runs northeast, flowing through Lake Isle and Lac Ste. Anne, both popular recreational lakes supporting a number of seasonal cottage communities along their shores. Leaving these lakes behind, the river turns east, then eventually south, running through the north edge of Matchayaw (also known as Devil's) Lake and dropping down into the north side of Big Lake's east basin. Along this stretch, several tributaries contribute their flow to the mainstem including Killini Creek, Toad Creek and Rivière Qui Barre. Two tributaries, Atim Creek and Carrot Creek, flow into Big Lake.

After leaving Big Lake, the Sturgeon River flows northeast through St. Albert and up to Gibbons (after being joined by Egg Creek) before making an abrupt turn to the southeast and dropping down to join the much larger North Saskatchewan River, a little downstream of Fort Saskatchewan. Throughout its journey, the Sturgeon River drops gradually from an elevation of about 840 metres above sea level at its headwaters, to about 600 metres at its mouth. The river itself is generally shallow and slow-moving, compared to the much larger North Saskatchewan River. The Sturgeon River contributes about one percent of the flows of the North Saskatchewan River, which in turn, eventually flow into Hudson's Bay.

A 'watershed' is an area of land that drains into a larger body of water such as a river, lake or ocean. The Sturgeon River watershed drains an area of 3,301 square kilometres (km^2) — about five times the area of the City of Edmonton. These lands can be characterized by two somewhat distinct geographic areas. The western half of the watershed, with a slightly higher elevation, gently undulating hills and poorer soils, falls in the Central and Dry Mixedwood Natural subregion. The eastern half of the watershed, with richer soils and flatter lands more suitable for agriculture, falls in the Central Parkland Natural subregion. The Sturgeon River watershed makes up about 5.8 percent of the lands included in the larger North Saskatchewan watershed (an area of about 57,000 km^2).

Along with the major lakes and tributaries described above, the Sturgeon River watershed also includes several smaller lakes (e.g., Birch, Deadman, Manawan, Sandy, Gladu and Atim lakes), wetlands and marl ponds (i.e., Wagner Natural Area), aquifers and other small water bodies. The uplands surrounding these water bodies are a mixture of natural (e.g., forest, shrub and grasslands) and developed (e.g., urban, country residential, agricultural and industrial) landscapes.

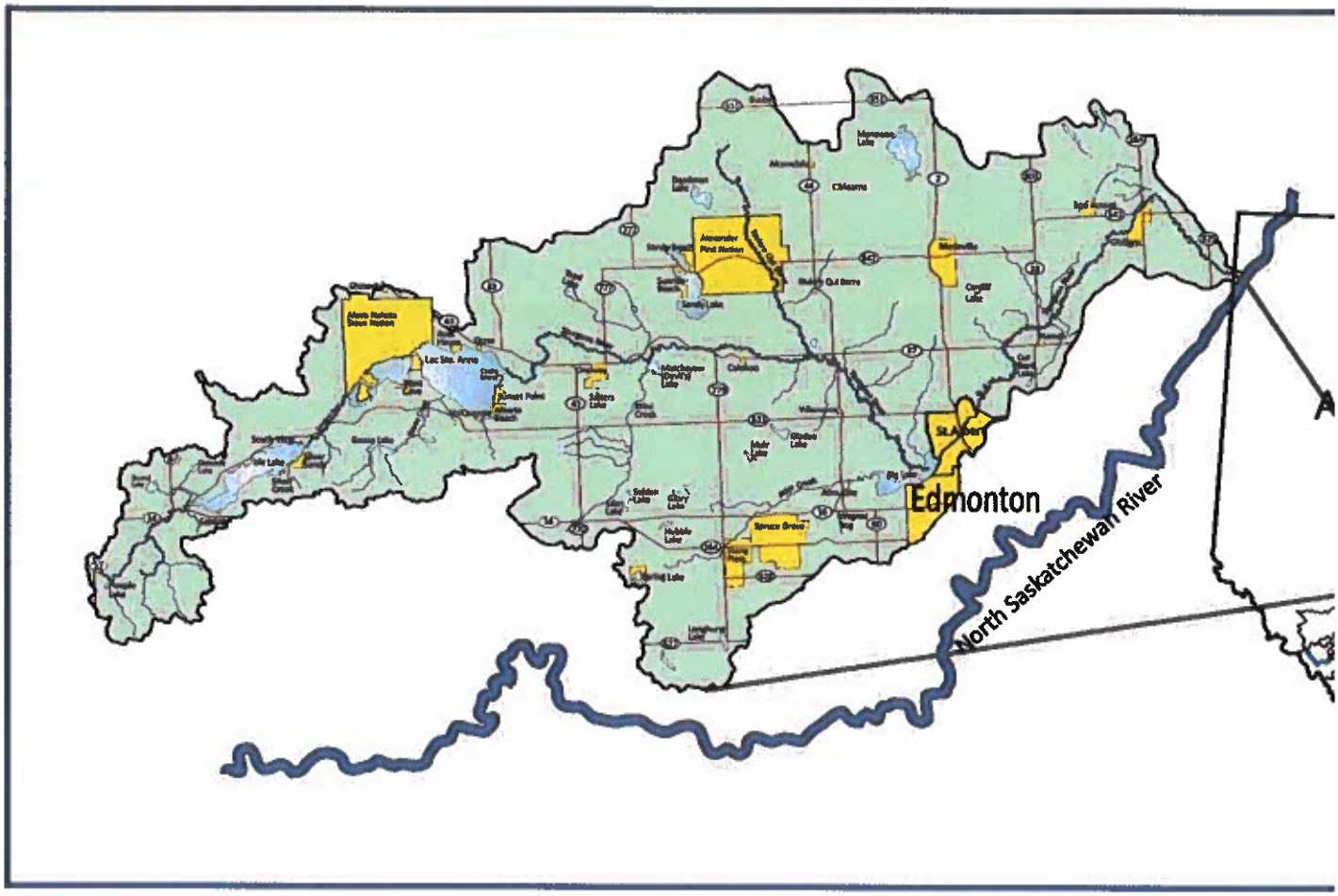


Figure 1. Map of the Sturgeon River and its watershed in relation to the North Saskatchewan watershed in Alberta.

Major Tributaries of the Sturgeon River

Toad Creek
Toad Creek is a small, ephemeral stream draining Toad Lake, a small waterbody about 10 km north of Onoway. From the lake, Toad Creek drops south to meet the Sturgeon River just east of Matchayaw (Devil's) Lake.

Kilini Creek
Kilini Creek starts south of Highway 16, near Johnny's Lake and Carvel Corner. It then travels northeast, flowing year-round into the west shore of Matchayaw (Devil's) Lake (north of the Town of Bilby). The Sturgeon River mainstem enters and leaves the lake on the north shore. The Kilini Creek Natural Area is a good example of a Mixedwood forest area, with a number of interesting features such as marl ponds and wild orchids. Parkland County has identified a portion of Kilini Creek as an Environmentally Significant Area.

Atim Creek
Atim Creek drains into the west end of Big Lake which in turn drains to the Sturgeon River. This watershed includes Atim Creek Natural Area, as well as Atim Creek Conservation site. Parkland County manages a portion of the creek under the Atim Creek North Area Structure Plan. The creek flows year-round, as it is influenced by dewatering and stormwater inputs from the Town of Stony Plain, which has recently produced a new Stormwater Management Plan (2018).

Carrot Creek
Similar to Atim Creek, Carrot Creek also drains into Big Lake (but from the north). This stream is a part of the City of St. Albert's water quality monitoring program. It also has an Environment Canada hydrometric station on it to record water flow. Flow stations were added to Atim and Carrot Creeks in 2006 in order to help monitor the changes in flows from urban development and in response to the Big Lake Stormwater Master Plan.

Rivière Qui Barre
Rivière Qui Barre starts near Busby, flows through a number of small lakes in the Alexander First Nation Indian Reserve, passes near the hamlet of Rivière Qui Barre, and eventually, empties into the Sturgeon River. The name of this river is said to be a French translation of the Cree phrase Keepootakawa ("river that bars the way"). Through sections of its course, Rivière Qui Barre is little more than a stream.

Little Egg Creek
Little Egg Creek is a small stream that flows out of Manawan Lake, past Cardiff, dropping south to meet the Sturgeon River before it reaches Gibbons. The Manawan Canal is used to move water from stormwater ponds in Morinville to where it is discharged to the Sturgeon River.

BRIEF HISTORY OF HUMAN HABITATION

There are a number of archaeological sites found throughout the North Saskatchewan River watershed such as the Ahai Mneh site south of Wabamun Lake in the Modeste sub-watershed (Schenk & Yanicki 2019). From these, we can assume that the Sturgeon watershed was likely inhabited by humans at some point after the glaciers receded and as plants and game species repopulated the lands, approximately 10,000 years ago.

Our earliest written history of the area comes through the first explorers, followed quickly by the fur traders and missionaries. By the time European explorers first visited the general area, both Woodland Cree and Nakota Sioux (Stoney) people were believed to be established in the Sturgeon watershed. Today, the Sturgeon River watershed is a part of Treaty 6 Territory. Alexander First Nation, a Woodland Cree community, is located at Sandy Lake. The Alexis Nakota Sioux Nation is located on the shores of Lac Ste. Anne. Although there are no Métis Settlements in the region, the Sturgeon River watershed falls within the Métis Nation of Alberta Region #4 and there are several local Métis associations in the area.

The Sturgeon River watershed also has a rich religious history with the first permanent Catholic mission in Alberta established at Lac Ste. Anne by Father Jean-Baptiste Thibault in 1842. This location is still an important pilgrimage site today.[1] Twenty years later, Father Lacombe established a mission[2] on the banks of the river in today's City of St. Albert.

Towards the end of the 19th century, the Sturgeon area was opened up to settlers for agriculture. The river provided many resources to early homesteaders including a source of drinking water for both humans and livestock, ice for refrigeration, and fish for sustenance. Early residents also used the river and surrounding area lakes for transportation and recreation including swimming and boating in the summer and skating in the winter.

Throughout the 20th century, the lakes and rivers of the Sturgeon watershed continued to play an important role to the communities that sprang up alongside them. Today, the Sturgeon watershed includes lands under the jurisdiction of the provincial government (e.g., Lois Hole Provincial Park), five counties (Parkland, Lac Ste. Anne, Barrhead, Westlock and Sturgeon), three cities (Spruce Grove, St. Albert, Edmonton), five towns (Stony Plain, Onoway, Morinville, Bon Accord and Gibbons), two First Nation reserves (Alexis and Alexander First Nations), the Villages of Alberta Beach and Spring Lake, and several hamlets and summer villages.

[1] For more on the Lac Ste. Anne pilgrimage, see the Lac St. Anne Pilgrimage website.
[2] For more on the St. Albert mission, see the St. Albert Catholic Parish website and the City of St. Albert Our History webpage.

While agriculture dominated early settlement, today, the Sturgeon watershed also supports gravel mining, moderate oil and gas activity, numerous commercial activities and a growing urban population[3]. This long history of growth and development has had an impact on the small Sturgeon River and its surrounding uplands.[4] The cumulative effects of cleared forests, cultivated lands, loss of native ground cover, drained wetlands, increases in impervious surfaces as well as stormwater and other run-off, have degraded the river to some degree. In more recent years, this has led to a number of initiatives advocating for greater efforts to "clean up" the river and its surrounding watershed.

PREVIOUS STUDIES AND INITIATIVES

The Sturgeon River watershed has long been of interest to researchers and resource managers for many different reasons. At the turn of the 20th century, settlement required a focus on soils and agriculture. Midway through the 1900s, other industries, such as logging and gravel mining, put the focus on business ventures, including commercial fishing. About the same time, recreation started to be a focus in Alberta, with several lakes in the watershed becoming important to the recreational communities that developed around them, and to the urban dwellers that could commute to them.

Throughout the 1970s and 1980s, several government staff and academics studied issues associated with Alberta lakes and rivers such as declining fisheries, water quality and water levels. Today, there is a fair amount of literature covering these topics. For a list of resources relevant to the Sturgeon watershed referred to in this document, see Appendix 2.

In more recent times, there have been numerous collaborations to investigate and manage water issues in the Sturgeon watershed. For example, the Big Lake Task Force was a partnership of seven municipalities (City of Edmonton, City of Spruce Grove, City of St. Albert, Town of Stony Plain, Parkland County, Sturgeon County and Lac Ste. Anne County) in place from 2003–2007 that collaborated on the completion of a storm water master plan for Big Lake. The main objectives of the plan were to facilitate orderly development, prevent flooding problems downstream of development areas, protect the environment and plan for future generations. One of the key recommendations of the *Big Lake Storm Water Master Plan* (2004) was that a Sturgeon River watershed management plan be developed.

In response to increasing development in the Capital Region, the Edmonton Metropolitan Regional Board (EMRB) developed *Growing Forward: The Capital Region Growth Plan,* a regulatory plan which member municipalities will have to follow, first approved by the Government of Alberta (GOA) on March 31, 2010 (then subsequently updated and re-approved in 2017). The plan addresses a wide range of issues affecting municipalities by providing principles and policies that promote integrated, efficient and sustainable growth in the Capital Region in a manner that protects the region's environment and

[3] For information on population growth by municipality, see the GOA's Alberta Regional Dashboard: enter a municipality and click on the 'Population' button for five and ten year trend data.
[4] For an interesting article on changes to the Sturgeon River over the past 100 years, see Derek Richmond's article *Is there hope for the Sturgeon River?*

resources, minimizes the regional footprint, strengthens communities, increases transportation choices, ensures efficient provision of services and supports regional economic development. Within the core principle entitled *Protect the Environment and Resources,* key policies include:

- Preserve and protect the environment
- Preserve agricultural lands
- Protect natural resources
- Minimize the impact of development on regional watersheds and airsheds
- Minimize the impact of heavy industrial development.

To continue with the momentum of the Big Lake Task Force, in 2012, the City of St. Albert funded and completed the *Sturgeon River State of the Watershed Report*. The purpose of this report was to summarize current knowledge with respect to land use, water quantity, water quality, fisheries and selected biological indicators, and to comment on the environmental integrity of the watershed. Recognizing that the Sturgeon River within St. Albert is affected by upstream users, the report was created for the entire watershed and its stakeholders including residents, regulators, policy makers, landowners and industry. The report found that the river's condition was "fair" by most measures, and "poor" in terms of its fish, vegetation, and nutrient (phosphorous) levels. It also identified a number of information gaps about the health of the watershed.

Also in 2012, the North Saskatchewan Watershed Alliance (NSWA) completed an Integrated Watershed Management Plan. This plan is a collection of recommendations and an approach for managing the North Saskatchewan River watershed to sustain water resources for the long-term and meet the three goals of the *Water for Life* strategy. The plan includes five goals as follows:

1. Water Quality in the North Saskatchewan River watershed is maintained or improved.
2. Instream flow needs of the North Saskatchewan River watershed are met.
3. Aquatic ecosystem health in the North Saskatchewan River watershed is maintained or improved.
4. The quality and quantity of non-saline groundwater are maintained and protected for human consumption and other uses.
5. Watershed management is incorporated into land-use planning processes at all scales.

Building upon these previous initiatives, a collaborative approach was proposed to address the watershed management needs of the Sturgeon River basin. The Sturgeon River Watershed Alliance (SRWA) was formed in 2014 to provide a platform for municipalities and others to work together to guide watershed stewardship in their counties, cities, towns, villages and other communities.

Finally, in undertaking an assessment of the watershed and before initiating a watershed management planning process, the SRWA noted several technical information gaps (e.g., the condition of riparian lands, the state of groundwater knowledge, the health of aquatic ecosystems). Several reports were commissioned to address these gaps and can now be found on the SRWA webpage. With information in hand, the Steering Committee prepared a draft watershed management plan. It then used the draft to seek input and engage other stakeholders before completing this final document.

PLAN PURPOSE

Throughout their work, the SRWA has collected information on what residents and other stakeholders' value about the Sturgeon River watershed. Although not a definitive list, some of the things the Sturgeon River watershed is valued for include:

- Its own intrinsic value as a natural ecosystem including the value of the ecological goods and services (e.g., clean air, clean water, wildlife habitat) it provides.
- Its cultural and spiritual significance to Indigenous communities, religious congregations and other residents and visitors.
- Its inherent beauty and and aesthetic appeal for recreation and leisure (e.g., boating, swimming, fishing, hiking, photography).
- As a source of raw drinking water supplies (i.e., largely from lakes and groundwater; no communities draw raw source water from the Sturgeon River mainstem itself).
- An important resource for agriculture (e.g., livestock watering, crop irrigation), industry (e.g., gravel mining, oil and gas extraction) and commercial enterprises (e.g., sod and potato farms, greenhouses, golf courses).[5]

The above values inform a vision developed by the SRWA for the Sturgeon watershed as follows:

> *The Sturgeon River watershed is recognized and valued as a natural prairie river system that connects our communities and adds to our quality of life. It is healthy, sustaining its ecological structure, processes, functions, and resiliency, within its range of natural variability. It is collaboratively stewarded by rural landowners, urban residents and Indigenous communities, and is managed with knowledge and ecological integrity as the foundation for decision-making that balances our social, cultural, economic and environmental well-being.*

In order to protect these cultural, social, economic and environmental values, and achieve this shared vision, the Sturgeon watershed must be actively and collaboratively managed. That is, land and water managers need to work together to provide long-term direction to maintain the quality of the Sturgeon River and its surrounding uplands. The Sturgeon River Watershed Management Plan (SRWMP) is intended to provide this direction. Additionally, the plan will:

- Provide a watershed approach to water management;
- Initiate an iterative and adaptive management process for the watershed with clear goals and performance measures and ongoing monitoring and assessment to ensure goals are met;

[5] For a list of licenced water users, see the GOA's Authorization Viewer, and enter 'Sturgeon River' as the waterbody.

- Work towards the alignment of provincial, regional and municipal policies and plans as they affect water and watershed health;
- Coordinate intermunicipal collaboration and stakeholder involvement to ensure successful implementation of strategies and actions within the watershed;
- Promote stewardship projects to be carried out alongside implementation of the plan; and
- Continue to identify and address knowledge gaps as they become known.

In developing this plan, the SRWA recognizes that water management is complex with a number of different components making up the watershed. In order to examine each of these components thoroughly, the SRWMP is organized around six key outcomes, as follows:

1. **Policies and plans are well-informed and align to support a healthy watershed.**
2. **All residents have access to safe, secure drinking water supplies, whether they are on public or private systems or draw from surface or groundwater.**
3. **Aquatic ecosystems, including our rivers, lakes, wetlands and other water bodies, are healthy.**
4. **The importance of water quantity is recognized and reliable, quality water supplies are available for people, livestock, and a sustainable economy.**
5. **Wise land use ensures the cumulative impacts of growth and development are mitigated, the land is resilient to climate change, and individuals and communities are well prepared for flood and drought events.**
6. **Residents and stakeholders support the Sturgeon River Watershed Management Plan and are willing to participate in local and regional initiatives to improve watershed health.**

Each outcome is discussed in more detail (with goals and strategies) in the sections that follow. Note however that topics overlap and are interrelated. That is, they are all important and all contribute to overall watershed health, both individually, and collectively.

Finally, throughout the development of the SRWMP, SRWA members indicated that the plan should also provide a clear picture of each municipality's relationship to, and work within, the Sturgeon River watershed. It should also recognize other groups working in the area. Hence throughout this document, a number of 'sidebar' text boxes provide information on individual municipalities, organizations, initiatives and available technical reports. While not exhaustive, this information begins to paint a picture of the diversity of concerned interests working to keep the Sturgeon River watershed healthy, for current and future generations to enjoy.

KEY OUTCOMES

Outcome 1. Policies and plans are well-informed and align to support a healthy watershed.

ALIGNED POLICIES AND PLANS

A number of provincial and municipal jurisdictions share responsibility for land and water management in the Sturgeon River watershed. Additionally, a hierarchy of policies, legislation, regulations and plans guide the orderly development of our lands and resources (Figure 2).

To be effective at managing shared waters, managers should be aligned and consistent in their policies and plans, as well as their enforcement, not only for areas where water crosses jurisdictional boundaries but also in the uplands surrounding such water bodies. The SRWA works to understand where provincial and municipal policies and plans are aligned for watershed health, and where work is needed to improve such alignment. Note that throughout this document, the term "healthy" refers to a watershed, waterbody or aquatic ecosystem that is "*sustaining its ecological structure, processes, functions, and resiliency, within its range of natural variability*" as defined by the Alberta Water Council (2008).

Under the GOA's revised (2019) *Municipal Government Act*, the purpose of a municipality includes *"to foster the well-being of the environment"*. Additionally, this includes managing water as per Section 60(1): *"subject to any other enactment, a municipality has the direction, control and management of the bodies of water within the municipality, including the air space above and the ground below"*. For more on this, see the Environmental Law Centre's *Municipalities and Environmental Law Part 2: Municipal Management of Water Bodies.*

- **Goal 1.1. Policies, plans and management actions are aligned to sustain the health of the Sturgeon River watershed.**
    - ***Strategy 1.1.1.*** *Incorporate values that support watershed health into federal, provincial, regional, municipal, resource and other policies, plans and actions by ensuring a watershed 'voice' is present in all policy and planning processes affecting the Sturgeon River watershed.*
        - Action: Continue to work with other municipalities though Alberta Urban Municipalities Association (AUMA), Rural Municipalities of Alberta (RMA) and Alberta Water Council processes to bring attention to the role of municipalities in watershed management.
        - Action: Submit the SRWMP to the GOA as information to inform its development of the North Saskatchewan Regional Plan (NSRP) as well as other relevant provincial and regional initiatives.

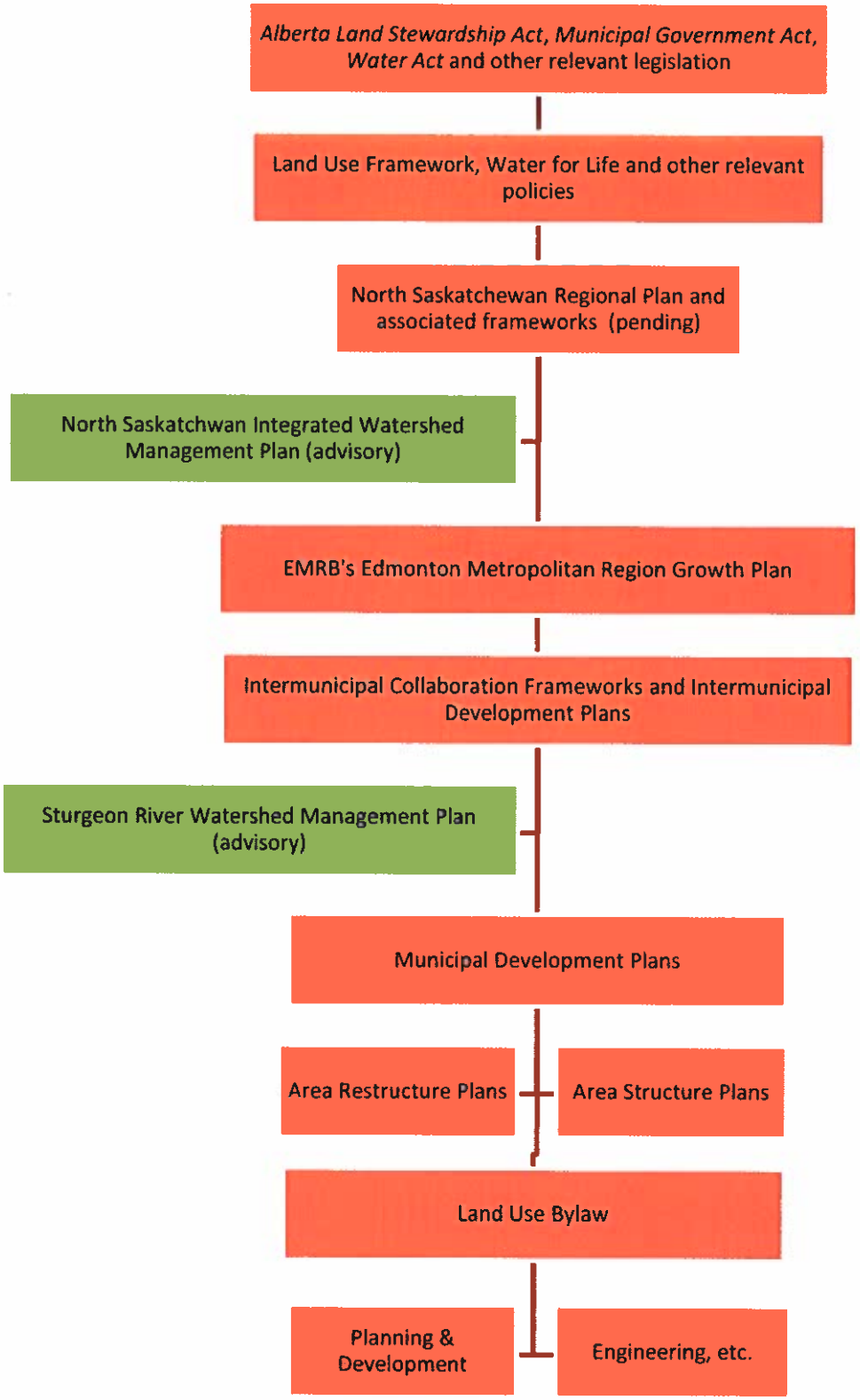


Figure 2. A hierarchy of authorities and tools are used to manage growth and development in the Sturgeon River watershed.

- Action: Submit the SRWMP to the Edmonton Metropolitan Regional Board (EMRB) as information for their consideration and continue to encourage partnering on future policy and planning projects.

- Action: Encourage individual municipalities to use the SRWMP to inform their own municipal policy and planning over time and as their documents and processes are developed and renewed.

- ***Strategy 1.1.2.*** *Encourage policy and plan alignment by ensuring technical water and watershed information informs the development of policies, plans and other management tools (e.g., bylaws, districting, reserves, setbacks, standards, map overlays, definitions, etc.).*
  - Action: Identify policy and planning gaps between municipalities in the Sturgeon River watershed, as well as adjoining watersheds, and compare, develop and share model policy statements, bylaws, definitions and other tools to fill such gaps and resolve differences (e.g., septic bylaws, pesticide bylaws, setback definitions).
  - Action: Wherever possible, develop and share spatial overlay maps (flood hazard areas, wetlands, natural areas, riparian setbacks, groundwater recharge/discharge areas) to inform land use planning and development processes.
  - Action: Recognizing the value of riparian intactness in securing water quality, make it a priority to work towards development of consistent policies and tools in protecting water bodies and their riparian buffers within the watershed.

Potential Implementers: NSWA, SRWA, GOA, municipalities

Performance Measures:

- Every municipality in the Sturgeon watershed supports a collaborative watershed approach as outlined in their governing documents.

City of Edmonton's North Saskatchewan River Valley Area Redevelopment Plan

A small portion of the Sturgeon River Watershed within the jurisdiction of the City of Edmonton is protected under the North Saskatchewan River Valley Area Redevelopment Plan as an environmental protection area. The major goal of the plan is to ensure preservation of the natural character and environment of the North Saskatchewan River valley and ravine system.

Following this policy direction, the City is acquiring all lands below the geomorphic limit of the River Valley and Ravine System as Environmental Reserve. Successful implementation of this plan has resulted in protecting and safeguarding the natural features of the river valley and a majority of its ravine system as an integrated part of the City's urban fabric.

Local governments in the region may consider similar best practices for the protection of lake, river and riparian ecosystem from rapid land use changes and urban development in the region.

INFORMED DECISION-MAKING

Throughout the process to develop a state of the watershed report in 2012, a number of information gaps about the Sturgeon River watershed were identified. The SRWA, in partnership with the NSWA and others, commissioned several reports to fill some of these areas.[6] However, additional data and information gaps remain. For example, Indigenous and other local knowledge about the watershed, and how it has changed over time, is not well documented, but could inform watershed health benchmarks and trend analysis. Additionally, groundwater, climate change, and the cumulative effects[7] of future growth and development are all areas that warrant further investigation.

In many cases, information is available but is not easily accessible or shared broadly. Information also becomes much more useful to managers and planners when it is displayed as geo-spatial maps or overlays and is embedded in formal statutory development approval processes. Equally important is the translation of information into everyday language that quickly informs 'decision-makers'. (Note that as we go about our daily business, we are all 'decision-makers' whose actions impact the watershed.)

As the SRWA and its partners continue to move forward, gathering and disseminating data and information in order to build knowledge and inform decision-making will be critical to the SRWMP implementation success. In particular, the SRWMP should be 'performance driven'. That is, it should use performance measures to benchmark and assess progress over time.

- **Goal 1.2. Decision-making in the Sturgeon River watershed is based on the best available knowledge.**
    - ***Strategy 1.2.1.*** *Identify, prioritize and fill information gaps, using both Indigenous knowledge and Western science, about the watershed.*
        - Action: Work with Indigenous communities to create opportunities to identify and appreciate Indigenous knowledge or ways of knowing and values related to the Sturgeon watershed.
        - Action: Develop a research strategy that identifies and prioritizes information gaps and methods to fill such gaps.
        - Action: Building on existing monitoring programs (e.g., City of St. Albert, CreekWatch, Alberta Lake Management LakeWatch program), establish a watershed-wide monitoring, evaluation and reporting framework.
    - ***Strategy 1.2.2.*** *Continue to develop and utilize mechanisms (e.g., meetings, workshops, Council presentations, reports, newsletters, technical studies, success stories and case studies, gap analysis) to share information to ensure decision-makers and others are well-informed about technical water issues in the Sturgeon watershed.*

[6] To see technical reports completed to date, see the SRWA webpage.
[7] For some information on cumulative effects in the North Saskatchewan watershed, see the NSWA report *Cumulative Effects of Land Uses in the North Saskatchewan River Watershed*.

- Action: Continue to engage the Province and municipalities (i.e., elected officials, senior management and technical staff) on key watershed issues through ongoing SRWA Steering and Technical Committee meetings, forums, workshops, publications, etc.
- Action: Provide guidance to municipalities on best practices around water management (e.g., stormwater management, low impact development, riparian restoration, etc.).

Potential Implementers: NSWA, SRWA, GOA, municipalities, Indigenous communities

Performance Measures:

- Municipal Councilors, Indigenous leaders and other decision-makers are knowledgeable about water issues in the Sturgeon watershed.
- Technical information gaps required by decision-makers to achieve watershed health are identified, prioritized and addressed.
- Policy and legislation gaps affecting water management practices are identified, prioritized and addressed.

Taking a Closer Look at Policies and Plans in the Sturgeon River Watershed

In general, 'policy' refers to a course of action, or plan, adopted or proposed by a government. Policy documents generally describe the direction a government wants to go on a certain topic. In the Sturgeon River watershed, there are many documents (e.g., inter-municipal and municipal development plans, land use bylaws and area structure plans) that describe the policy directions and plans of the various jurisdictions that reside here. The ongoing development and renewal of such documents provides an opportunity to incorporate watershed principles into provincial and municipal policy and planning.

To understand some of these documents better, the NSWA commissioned the report "Planning Tools for the Sturgeon River Watershed" (ParioPlan 2019). The purpose of this report was to encourage more consistent and effective watershed protection and advance more consistent land use planning throughout the Sturgeon watershed. As such, it provides a snapshot of the current policy context and makes several recommendations on areas where policy can be aligned to improve the protection of the Sturgeon River watershed at multiple stages in the planning process.

Delving into this topic a little deeper, the NSWA commissioned a second inhouse report: *Sturgeon River Watershed: Recommendations for Planning Alignment Report (Beaubien 2020)*. Together, these reports identified a number of areas where policy alignment would benefit the Sturgeon watershed. This includes (but is not limited to) the following:

- mapping of flood prone areas, rules for development in flood prone areas, flood and drought resiliency planning
- conservation and restoration of wetlands and riparian areas
- identification, protection and conservation of environmentally significant areas
- definition, identification and mapping of hazard lands such as floodplains, steep slopes and high groundwater risk areas
- determination of setback and buffer requirements; taking of environmental and conservation reserve
- techniques for stormwater management, low impact development, road salt and snow management
- waste water management
- groundwater management
- environmental monitoring, evaluation and reporting
- the planning process, use of districting
- the development process, erosion control requirements, lot coverage policies, etc.

Parkland County – Keeper of the Sturgeon River Headwaters

Parkland County, located west of Edmonton, is a municipality with a population of about 32,000 largely rural residents. As such, the County is the manager for those lands in around Hoople and Round lakes (northwest of Stony Plain), the headwaters of the Sturgeon River. The headwaters of Kilini and Atim creeks, major tributaries of the Sturgeon River, also lie within the County's boundaries. And finally, the Carvel Pitted Delta underlying the county, is a major groundwater recharge area.

In fact, the County includes a number of unique waterbodies (e.g., Spring Lake, Wagner Natural Area). Additionally, many of the county's residents rely on groundwater wells for domestic, agricultural and commercial water supplies. Hence, the County is well-versed in water management issues. Examples of policies supporting a collaborative watershed approach can be found throughout their governing documents. In addition, the County has commissioned several reports that support a healthy Sturgeon River watershed including:

- Environmental Conservation Master Plan
- Wetland Inventory
- Stormwater Management Facility Naturalization Policy
- Biophysical Assessment Policy
- Park Development Plan

Parkland County also uses a number of tools to manage development near water bodies. For example, in order to manage lakeside development, they may designate a *Lakeshore Residential District* with specific rules for tree clearing, parcel coverage, setbacks from the shoreline and hazard lands, and development in floodplains.

The county also collaborates with its neighbouring municipalities (e.g., Lac Ste. Anne County) and nearby urban jurisdictions (Town of Stony Plain, City of Spruce Grove). For example, an Intermunicipal Development Plan (IDP) between Parkland and Lac Ste. Anne counties recognizes the significance of their shared watershed, as well as the importance of collaborating to maintain watershed health.

Outcome 2. All residents have access to safe, secure drinking water supplies, whether they are on public or private systems or draw from surface or groundwater.

SAFE, SECURE DRINKING WATER SUPPLIES

In the past, several small communities relied on the Sturgeon River, or local small lakes or groundwater wells, as their domestic drinking water sources. However, in more recent years, most communities have joined larger regional networks. In the Capital Region, EPCOR, a private utility owned by the City of Edmonton, extracts water from the North Saskatchewan River, treats the water for consumption, before pumping it to its regional water customers (Figure 3).

While there are many economies of scale and other advantages to being a part of a larger network, there are also some risks. Individual municipalities still have to maintain their own water storage and distribution systems (including reservoirs, pumping stations, pipelines and service connections) and they still have to manage potential contamination or drought events[8]. Additionally, if a spill on the North Saskatchewan hindered EPCOR's intake, a larger number of people would be affected than if everyone had their own systems. To manage this, EPCOR has a source water protection plan that identifies risks and potential mitigation. However, in the event of a disruption, smaller communities must also consider back up plans, source protection, water conservation measures, etc. Communities in the Sturgeon watershed also need to plan for future residential development and from where such developments will access potable water. Capacity constraints could require new or upgraded storage and delivery infrastructure.

While regulated public water systems deliver water to many communities, many individual land owners (i.e., farmers, ranchers and acreage owners) maintain unregulated private drinking water systems largely from groundwater wells but also including the use of dugouts and cisterns. These private systems can be affected by periods of drought and can provide a pathway for contamination. Hence, their management is equally important as that of public systems.

- **Goal 2.1. Residents in the Sturgeon watershed have access to safe, secure drinking water supplies.**
    - ***Strategy 2.1.1.*** *Improve understanding of the current state of drinking water demand and supply systems including both public and private sector and the issues residents are encountering with these systems.*

[8] For an example of how municipalities are conserving water, see the City of St. Albert's Water Conservation, Efficiency and Productivity Plan or City of Spruce Grove's Water webpage.

- Action: Encourage municipalities to use surveys, workshops and other means to better understand private water systems (including wells, dugouts and cisterns) and the issues residents are encountering with these systems.

- ***Strategy 2.1.2.*** *Promote source water protection.*

  - Action: Ensure the public are knowledgeable about private drinking water system management and potential impacts to water supplies by encouraging participation in the GOA's Working Well Program and Drinking Water testing programs.

  - Action: Provide educational materials and promote agricultural, household and commercial beneficial management practices to protect source water quality.

Potential Implementers: SRWA, NSWA, municipalities, private drinking water system operators (acreage and landowners), Alberta Environment and Parks, Alberta Health

Performance Measures:

- Treated drinking water quality parameters meet provincial guidelines
- Domestic groundwater wells are not impacted by anthropogenic contaminants (e.g., *E. coli*, nutrients) and other pollutants (e.g., nutrients, toxic metals and hydrocarbons)
- Number of residents who participate in Working Well workshops

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WELL-MANAGED GROUNDWATER

Groundwater in the Sturgeon River watershed is an interesting area of study with a number of unique components such as the Carvel Pitted Delta, buried meltwater channels, springs and marl ponds. Groundwater is also an important source of water across the watershed for a variety of users including:

- Drinking and domestic water for rural residents (i.e., farms and acreages) and lake communities (e.g., Alberta Beach)
- Water for agriculture (e.g., livestock watering and irrigation)
- Water for industry (i.e., mainly gravel dewatering and washing) and commercial use (e.g., irrigation for sod and potato farms, golf courses, greenhouses)

Additionally, groundwater is a component of the water balance of lakes, rivers and wetlands. Some wetlands (such as the Wagner Natural Area) are highly dependent on groundwater, while the winter baseflow in most creeks and rivers can be derived from groundwater. Some water-loving plants, like willows and poplars, may also rely on groundwater flows. During periods of drought, groundwater inputs to surface water bodies can buffer water level declines. In closed basin pothole lakes (e.g., Spring and Hubbles lakes), groundwater outflow may represent the only mechanism of flushing contaminants from the lake.

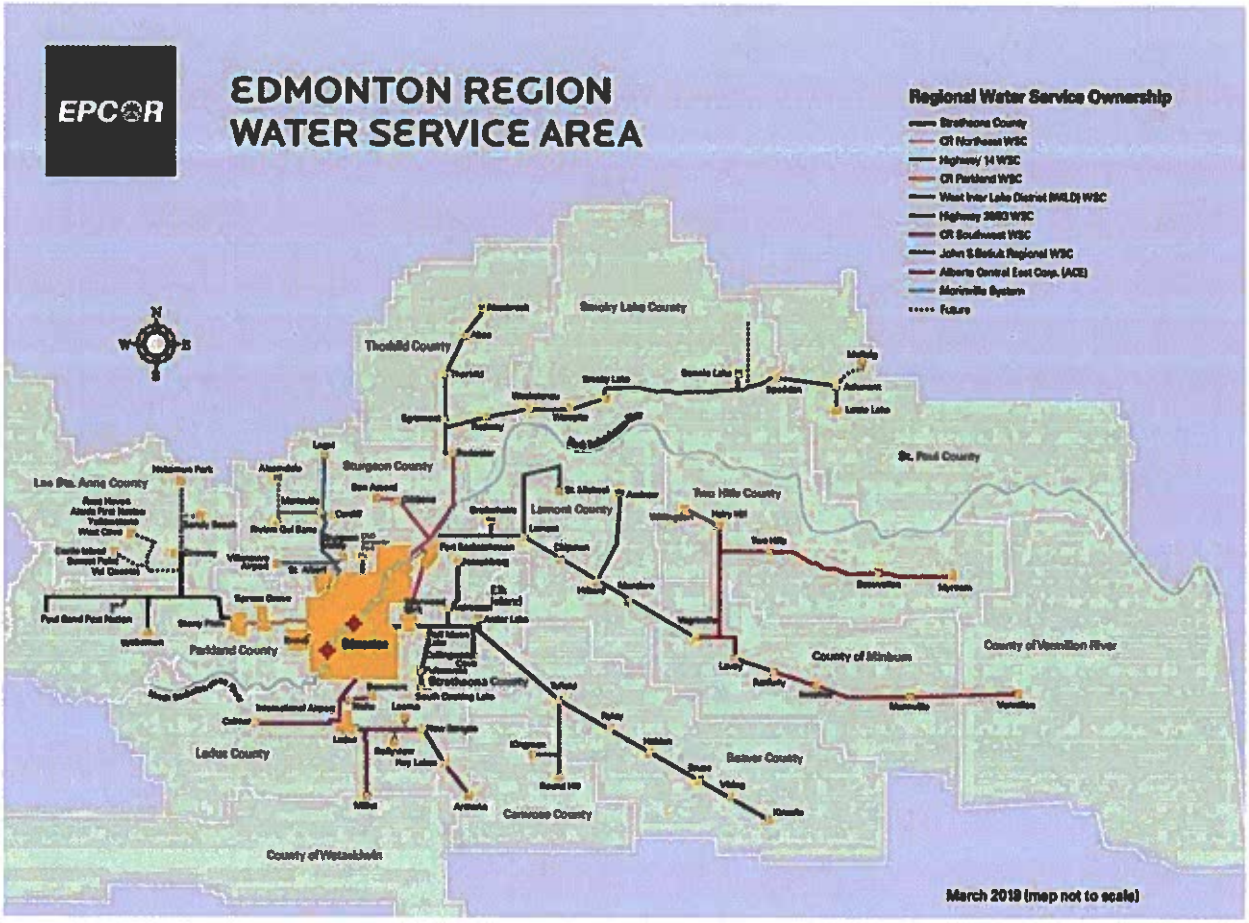


Figure 3. EPCOR's Edmonton Region Water Service Area.

While some studies have been done, in general, we don't have a detailed understanding of the current state of groundwater quantity and quality in the Sturgeon watershed. Additionally, we know that localized issues do arise in some areas at some times such as:

- Inadequate supply or well drawdown or dewatering/depressurization of some wells, particularly in drought years
- Inadequate quality in some areas due to presence of naturally-occurring elements (e.g., sodium, iron)[9]
- Local and larger scale impacts to groundwater due to the cumulative effects of urban, industrial and agricultural activities

Additionally, there is a lack of information and knowledge, particularly around aquifer characteristics and surface-groundwater interactions, to inform land use planning and decision-making. There is also a lack of examples, case studies, etc. showing how municipal tools can be used to protect aquifers and

[9] For information on drinking water data, see the GOA's Alberta Environmental Public Health Information Network (AEPHIN) website.

their recharge and discharge areas. And finally, there is a lack of comprehensive long-term monitoring networks and capacity /resources to identify spatial/temporal long-term trends to groundwater quality or quantity or for undertaking additional groundwater studies.

Groundwater is, for the most part, managed provincially through water allocations, the wetland policy, well monitoring and other programs. Because urban, agricultural and other land uses may affect groundwater quality (i.e., risk of contamination) and quantity, protecting this resource is a land-use planning issue that municipalities should be aware of. Additionally, groundwater is also physically connected to surface water features that contribute to community identity (i.e., the Sturgeon River) and highly valued recreational water bodies – another reason why municipalities should be aware of this resource.

- **Goal 2.2. Groundwater is understood and managed sustainably.**
    - ***Strategy 2.2.1.*** *Improve our knowledge about the quality and quantity of groundwater in the Sturgeon watershed and how it interacts with surface water.*
        - Action: Encourage the GOA to maintain and/or enhance groundwater well monitoring programs (e.g., GOA well database, groundwater observation well network).
        - Action: Undertake trend analysis of existing well information to understand temporal changes in groundwater quality and supply within the Sturgeon River watershed.
        - Action: Encourage the province to undertake groundwater studies at the watershed and sub-watershed scale, providing relevant maps and tools to municipalities for land management planning and decision-making.
    - ***Strategy 2.2.2.*** *Manage land use development such that key groundwater recharge and discharge areas are not impaired.*
        - Action: Identify key recharge and discharge areas and areas at risk of contamination and use provincial (e.g., the Alberta Wetland Policy) and municipal tools (e.g., map overlays, environmental reserve, aquifer signage) to protect such areas as they are identified (e.g., Carvel Lakes, Wagner Fen).
        - Action: If/where required, under the North Saskatchewan Regional Plan, develop Groundwater Management Frameworks that protect well heads, artesian flow areas, important recharge and discharge areas and aquifers, and prevents contamination and the cumulative effects of development on groundwater quantity and quality.
        - Action: Educate municipal staff, including planners, about potential groundwater contamination risks.

Potential Implementers: SRWA, NSWA, GOA, Alberta Geological Survey (AGS), municipalities

Performance Measures:

- Number of rural residents who test their drinking water regularly (as per a municipal survey).
- Number of municipalities utilizing groundwater policies and management tools (measured now and at future five-year intervals).

Taking a Closer Look at Groundwater in the Sturgeon River Watershed

Water managers are increasingly aware of the significant role groundwater plays in a watershed. In the Sturgeon River watershed, groundwater is an important domestic, agricultural and municipal resource. Groundwater also contributes to surface water river flows and lake levels.

To learn more about this resource, the SRWA commissioned the *Summary of Groundwater Conditions in the Sturgeon River Basin (Oiffer 2019)*. This report provides an overview of the hydrogeological conditions in the Sturgeon River Basin. It is based on existing information and takes a look at the role of groundwater in sustaining the Sturgeon River and several lakes in the basin. Additionally, the report identifies key data gaps in the understanding of the potential interactions of groundwater with the Sturgeon River and local lakes and provides a number of recommendations for addressing these gaps.

Managing Activities around High Groundwater Levels

Areas with high groundwater levels exist throughout the Sturgeon watershed, affecting activities such as gravel mining, sub-surface construction and septic field placement. In particular, high groundwater levels make grading or excavation difficult, as inundation and sloughing may occur.

Depending on where excess water is directed to, disturbances can also affect the water quality and flows of downstream receiving waters. In particular, the areas around Stony Plain and Spruce Grove are known to have high groundwater levels, affecting how development occurs in this area. Generally, developers try to avoid sub-surface dewatering. Residential housing is designed and constructed at elevations that are higher than the normal groundwater level to ensure that dewatering does not occur and that subsurface flows are maintained.

This is particularly important around sensitive areas such as the Wagner Natural Area, a unique fen wetland, just south of Highway 16. The City of Spruce Grove's *East Pioneer Area Structure Plan* and Parkland County's *Acheson Industrial Area Structure Plan* both identify this ecologically significant area. Tools such as 'Estate Residential' districting can be used to maintain large areas of open space, reducing the amount of runoff and allowing water to infiltrate the soil. Additionally, buildings developed in the area must be constructed at an elevation greater than the normal groundwater level in order to ensure that sump pumps do not affect sub-surface flows. Geotechnical studies are also required before development occurs.

Where dewatering is required, pumped groundwater must be directed somewhere. In the case of gravel mining, excess waters are usually held in a dewatering pond, rather than contaminating local surface water bodies. In urban areas, dewatering is usually routed to local stormwater systems, which in turn empty to small tributary creeks and eventually flow into the Sturgeon River. Where dewatering occurs, it is important to monitor and release water at rates similar to pre-development.

Outcome 3. Aquatic ecosystems, including our rivers, lakes, wetlands and other water bodies, are healthy.

IMPROVED WATER QUALITY

Water quality in the Sturgeon watershed is generally sufficient for uses associated with agriculture, industry and small commercial enterprises such as golf courses and sod farms. Water quality is also important to the aquatic ecosystems it supports, and for the recreational opportunities, such as boating and fishing, it provides. However, in more recent years, more frequent blue-green algae blooms, excessive plant growth, concerns about contaminants and aesthetics (i.e., smell, appearance) have many users re-considering activities like swimming or consuming fish.

Small, shallow rivers like the Sturgeon tend to be warmer than larger, deeper water bodies, and higher in nutrients, with more plant growth and lower oxygen levels. Smaller tributaries can be more sensitive than the mainstem. Although naturally rich in nutrients such as phosphorus and nitrogen, our recreational lakes are also sensitive to additional nutrient loading. Waste water releases, stormwater and diverse (non-point) source loadings (such as sediment, fertilizers, pesticides, manure and other contaminants) can all affect water quality. However, without comprehensive water quality monitoring and assessment, their impact may not be well understood or addressed until a major event, such as a fish kill or blue-green algae advisory draws attention to the issue.

- **Goal 3.1: Water quality in the Sturgeon watershed is improved.**
    - ***Strategy 3.1.1.*** *Improve understanding of the health and resiliency of the Sturgeon River watershed by monitoring, evaluating and reporting on water quality and other aspects of aquatic ecosystem health.*
        - Action: Use both technical and traditional knowledge to inform the selection of a suite of indicators (e.g., fish communities, benthic invertebrates, water quality parameters) to monitor the aquatic ecosystem health of the Sturgeon River watershed including the mainstem, priority tributaries and key lakes.
        - Action: Periodically assess indicator information collected and use this assessment to publicly report on the state of the Sturgeon River watershed every five years.
    - ***Strategy 3.1.2.*** *Identify and reduce point and non-point sources of nutrient and contaminant loading in the Sturgeon watershed.*
        - Action: Ensure awareness and if required, enforcement of existing federal, provincial and municipal regulations such as the *Water Act*, *Public Lands Act*, *Environmental Protection and Enhancement Act*, *Agricultural Operational Practices Act*, municipal Land Use bylaws, etc.
        - Action: Reduce contaminant loading from point sources by improving waste water management and centralizing sewage lagoon collection and treatment systems.

- Action: Reduce sediment and salt loading by promoting transportation and road Best Management Practices (BMP) such as Alberta Transportation and Transportation Association of Canada Guidelines, federally required Salt Management Plans, and snow facilities melt water best practices.
- Action: Reduce nutrient loading from rural non-point sources by working with rural residents, businesses and agricultural producers to promote BMPs (e.g., to reduce fertilizer and pesticide use near water bodies).
- Action: Reduce nutrient loading from urban non-point sources by improving stormwater management, addressing increased flows created by development, incorporating Low Impact Development (LID) principles and promoting educational programs (e.g., Yellow Fish Road).
- Action: Where needed, incorporate more stringent use of setbacks, as promoted by the GOA's *Stepping Back from the Water* guide, into bylaws.

Potential Implementers: SRWA, NSWA, municipalities, stewardship groups, landowners and conservation programs (e.g., ALUS Canada and similar municipal initiatives)

Performance Measures:

- Water quality parameters meet guidelines for aquatic life and/or show improvements.
- Number of communities using sewage lagoons in 2020, 2025, 2030.
- Number of municipalities with Salt Management Plans or amount of salt/sand applied per km

City of St. Albert Water Quality Monitoring Program

As the Sturgeon River passes through the outlet of Big Lake, it runs through the heart of the City of St. Albert. Since its early days, the city has grown up around the river's banks and city residents have used the river for a variety of activities such as swimming, fishing, boating, skating and skiing. Even today, residents, walk, bike and roller blade along the Red Willow Trail system of which the Sturgeon River is a major component.

With this strong attachment to the river, it is no surprise that St. Albert has a long history of involvement in watershed management. The City commissioned the State of the Watershed report in 2012 and is a founding member of the SRWA. City staff have undertaken several initiatives along the river, including shoreline clean-ups, riparian plantings and invasive plant removal. The City conducts annual water quality testing on the Sturgeon River, stormwater management facilities and stormwater outlets along the river (since 2006), reporting on several key parameters (e.g., total phosphorus, total nitrogen, chlorides, total suspended solids and *E. coli*) in their annual *Report on the Environment*. In 2017 and 2018, the City of St. Albert partnered with Alberta Environment and Parks in an invasive species program that saw the removal of approximately 45,000 goldfish from city stormwater management facilities. For more information on the City of St. Albert's work on the Sturgeon River, see their Sturgeon River Watershed webpage.

HEALTHY AQUATIC ECOSYSTEMS

Aquatic environment is defined on page 9 of Alberta's *Water Act* (2000) as the *"components of the earth related to, living in, or located on water or its shores, including its organic and inorganic matter, living organisms and their habitats, and their interacting natural systems."* A Healthy Aquatic Ecosystem is defined by the Alberta Water Council in its *Healthy Aquatic Ecosystems – a Working Definition* (2008) report as *"an aquatic environment that sustains its ecological structure, processes, functions, and resilience within its range of natural variability."*

The Sturgeon River watershed aquatic ecosystem includes the Sturgeon River mainstem, its named and unnamed tributaries, lakes, wetlands, aquifers, floodplains and riparian areas. It also includes the plants, fish and other wildlife (biodiversity) that inhabit these spaces. The Sturgeon River watershed aquatic ecosystem provides numerous benefits such as:

- A source of traditional food (e.g., fish, berries etc.) and medicinal plants
- Aesthetically pleasing areas for recreation and cultural activities
- Improved water quality through the trapping and filtering of sediment, nutrients and pollutants by riparian areas and wetlands
- Water storage; conveyance (delivering water to downstream users); flushing flows (important for maintaining the river channel); and waste water dilution
- Biodiversity by providing habitat, wildlife corridors, cool and clean waters, etc.
- Economic value (real estate premiums, forage/woodlot production, dollar value of water, etc.).
- Moderating local climate, mitigating floods and droughts and reducing erosion by storing/slowly releasing run-off and other waters

The health of aquatic ecosystems can be affected by activities that occur on or around them. Several reports suggest that the Sturgeon aquatic ecosystem is under stress from a number of pressures.[10] These include:

- Declining water quality due to point (end of pipe waste water/stormwater discharge) and non-point (diffuse runoff) sources of pollution such as sediment, nutrients and other contaminants
- Land use decisions (such as agriculture, urban development, vegetation clearing, wetland drainage and floodplain development) that affect the volume, quality and rate of run-off flow over the landscape
- Degraded habitat through the loss of wetlands and riparian areas resulting in warmer surface water, lower dissolved oxygen, decreased biodiversity and increased invasive species. The loss

[10] For more information on aquatic ecosystem health in the Sturgeon, see *Sturgeon River 2017 Aquatic Ecosystem Assessment* (CPP Environmental 2019).

of these areas reduces the ability of landscapes to collect water for retention, infiltration and the slow release of water

- Harvest pressure on fish populations (subsistence harvest, previous history of commercial and recreational catch and keep, mortality from current catch-and-release practices)
- Regulatory compliance and enforcement issues (e.g., encroachment/damage to public lands or environmental reserves or not obeying development setbacks)
- Water withdrawals (for agriculture, industry and domestic use) together with climate change (particularly warmer temperatures) leading to periods of low flows (usually in late summer) resulting in beach closures, blue-green algae, fish die-offs, and poor aesthetics

In particular, the health of riparian lands (the shores of lakes and rivers) have declined in the Sturgeon watershed. From a recent (Fiera 2018) riparian assessment, the current state of riparian intactness shows that approximately 25% of riparian areas in the Sturgeon watershed have *very low intactness*, 20% have *low intactness*, 15% have *moderate intactness* and 40% have *high intactness*.[11]

Similar to riparian areas, wetlands also play an important role in the watershed, contributing to water quality, the storage and slow release of water, and providing habitat for a variety of wildlife species. Over the past century, about 70% of the wetlands in the Sturgeon watershed have been drained to make way for agriculture and urban expansion (MacDonald *et al.* 2019). Further work needs to be done to understand how this has affected river flow and basin hydrology but in general, as the watershed loses its ability to act as a 'sponge', it becomes more 'flashy' with large precipitation events having the potential to lead to more 'flash floods', erosion, infrastructure damage and other costs.

Fisheries, an important resource for Indigenous subsistence use and for recreational anglers, are another area of concern. The Sturgeon River is named after the Lake Sturgeon; however, this species is no longer found in the river.[12] Other species of importance include walleye, pike, perch, burbot, goldeye, whitefish, and sauger. Today, low flows, warming waters and a lack of shady shorelines can lead to loss of fish spawning areas, low dissolved oxygen and fish kills.

Together with fisheries, all biodiversity is important and more work needs to be done to improve our understanding of the state of aquatic plants, invertebrates and other wildlife in the Sturgeon watershed. Unfortunately, invasive species such as Flowering Rush and Asian Goldfish are present and these also need to be inventoried and managed.

- **GOAL 3.2. Aquatic ecosystems in the Sturgeon watershed are healthy.**
    - ***Strategy 3.2.1.*** *Improve our knowledge about the current state of aquatic ecosystem health in the Sturgeon River watershed.*

[11] For more information on riparian intactness, see the Sturgeon Watershed Riparian Area Assessment report (Fiera 2018).
[12] For more about this species, see the GOA's Alberta Lake Sturgeon Recovery Plan 2011 - 2016.

- Action: Seek research partnerships to study/ model the impact of cumulative effects on aquatic ecosystem health and its components, including water quality and quantity.
- Action: Seek funding to establish more continuous flow gauging stations, particularly at lake outflows to improve lake water balance calculations.
- Action: Conduct an ecosystem valuation of the Sturgeon River watershed (considering ecological services, water supply and regulation, climate regulation, social and recreational values, etc.) to inform local government planning and development.

- ***Strategy 3.2.2.*** *Improve aquatic health by developing and implementing wetland and riparian area protection and restoration strategies.*[13]
  - Action: Improve the public availability and use of common wetland and riparian management tools (e.g., education programs, incentive programs, land reserves, restoration programs).
  - Action: Complete a drained and existing wetland inventory for the watershed (Parkland County portion has been done).
  - Action: Develop wetland, riparian and flood plain conservation and restoration goals and targets and advocate for their inclusion in municipal planning documents, as they are developed and renewed.
  - Action: Support the work of land managers/stewardship programs to protect/restore riparian buffers along wetlands, lakes and creeks of the Sturgeon River watershed.
- ***Strategy 3.2.3.*** *Improve the fisheries resource.*
  - Action: Conserve priority fish habitat (areas known to be well oxygenated with good flows) for key fish species and/or life stages.
  - Action: Improve fish habitat where conditions (e.g., dissolved oxygen, flow) are known to be poor and where such conditions have led to fish kills in the past.
- ***Strategy 3.2.4.*** *Prevent the occurrence and/or spread of aquatic invasive species.*
  - Action: Conduct surveys, inventory occurrences, and prioritize areas/actions to prevent, contain, mitigate and where possible eradicate invasive species.
  - Action: Work with invasive species organizations to educate residents and visitors about what they can do to minimize the introduction and spread of invasive species.

Potential Implementers: SRWA, NSWA, AEP (Fisheries), ACA

Performance Measures:

- Measurable and continual improvements to aquatic ecosystem components particularly water quality, riparian areas, wetlands and fisheries.

[13] A riparian and wetland protection and restoration strategy should build on the findings of the watershed land use and hydrology modelling work done in *An Identification and Evaluation of Strategic Priorities for Conservation and Restoration to Improve Watershed Resiliency in the Sturgeon River Watershed (Macdonald et al. 2019)*

NAIT Sturgeon Research and Restoration Projects

Inspired by the fish that the Sturgeon River is named after, Laurie Hunt and Debbie Webb, both instructors at NAIT's Biological Sciences Department, undertook a five-year project looking at the health of the Sturgeon River. From 2010–2015, working with students and volunteers, they assessed conditions at 23 sites across the watershed in order to better understand water quality, aquatic biodiversity and riparian health. They also assessed several stream crossings/roads affecting sedimentation or blocking fish passage. The pair also conducted a public survey to gauge perspectives on watershed issues and engaged local school and community groups in shore restoration projects (tree and shrub planting).

Assessment results showed that the Sturgeon River has become shallower, slower, more polluted and starved for oxygen, over time. Biodiversity has declined and the river has less recreational and aesthetic appeal than it once did. While these qualities can be restored, recovery of the Sturgeon River will take time. *"If every community said 'we're going to work to re-implement riparian buffers', that would have an overall, long-term, positive effect," says Hunt.* For more information about this work, see their project YouTube video or this article in *Tech Life Today*.

Aquatic Ecosystem Health – Digging Deeper

Aquatic ecosystem health is a large, complex topic with many different components. To improve our understanding of the health of aquatic ecosystems in the Sturgeon River watershed, the SRWA commissioned two comprehensive studies.

The first study used a digital desktop method to assess the condition of riparian areas as reported in Sturgeon Watershed Riparian Area Assessment (Fiera 2018). The second study looked at several components of the aquatic ecosystem, including fish, benthic invertebrates, habitat and water quality, as reported in Sturgeon River 2017 Aquatic Ecosystem Assessment (CPP Environmental 2019).

While both these reports provide only a snapshot in time, their message is similar to that of the NAIT project. The health of the Sturgeon River and its watershed have declined. Additionally, one can also derive from these findings that the current suite of management processes and tools being used to manage the watershed are not working to maintain aquatic health throughout all parts of the basin. If the status quo isn't changed, decline will likely continue to occur in some areas.

RESILIENT LAKES

Large, deep lakes, with good water clarity for recreation, are a very limited resource in Alberta. As the population continues to grow, the value of lakes, particularly near urban centres, also increases. As a finite public resource, the importance of lakes and their management needs to be recognized by both provincial and municipal land and water managers.

In the Sturgeon watershed, Lake Isle and Lac Ste. Anne are well developed recreational lakes with a number of summer villages along their shorelines.[14] The Lake Isle and Lac Ste. Anne Water Quality Management Society and Lake Isle Aquatic Management Society are active advocates for these lakes. In 2017, the NSWA's *Isle Lake and Lac Ste. Anne State of the Watershed* report provided a closer look at these two lakes, identifying a number of issues (e.g., water quality, blue-green algae, invasive species, etc.) and making several recommendations to improve lake health.

Lakeshore Communities in the Sturgeon Watershed	
Summer Village	**Water body**
Silver Sands	Isle Lake
South View	Isle Lake
West Cove	Lac Ste. Anne
Castle Island	Lac Ste. Anne
Sunset Point	Lac Ste. Anne
Ross Haven	Lac Ste. Anne
Val Quentin	Lac Ste. Anne
Yellowstone	Lac Ste. Anne
Sandy Beach	Sandy Lake
Sunrise Beach	Sandy Lake
Village	**Water body**
Alberta Beach	Lac Ste. Anne
Spring Lake	Spring Lake
Unincorporated Communities	**Water body**
Lake Isle	Isle Lake

Additionally, several smaller and/or less developed lakes, such as Sandy Lake, Matchayaw Lake and Big Lake[15] also provide recreational opportunities for fishing, boating, and swimming. The Big Lake Environmental Stewardship Society is an important advocate for Big Lake. Similarly, a number of local Fish and Game Clubs are stewards for several smaller lakes in the watershed. For example, Onoway District Fish and Game Association and Gun Club maintain Salter's Lake as well as Imrie Park on Matchayaw Lake. Spruce Grove and Stony Plain Fish and Game Associations have assisted the provincial government and Alberta Conservation Association (ACA) with stocking several local lakes such as Spring Lake, Star Lake and East Pit Lake. For more information, see the ACA Stocked Lakes webpage.

While lake health varies in the Sturgeon watershed, issues are common across the watershed. Agricultural development at the turn of the century converted forested lands into fields and has contributed to sediment input and nutrient loading to lakes since that time. Lakeside cottage development during the 1950s and 1960s altered riparian shorelines, impairing water quality and fish habitat. During the 1980s and 1990s, lake levels fell in connection with a period of drought.[16] Today, increased development adjacent to lakes means more impervious surfaces and issues with stormwater run-off. Additionally, the threat of invasive species is being experienced first-hand in this watershed with Flowering Rush and other species. As well, the introduction of aquatic mussels is only a matter of time, given the high volume of boat traffic at recreational lakes in this watershed. Asian goldfish have also been documented in stormwater facilities in Edmonton, St. Albert and Spruce Grove.

[14] Note that the NSWA commissioned the Isle Lake & Lac Ste. Anne State of the Watershed report (2017) and the Isle Lake & Lac Ste. Anne Water Balance Assessment (2016).

[15] For a description of Big Lake, see the BLESS website.

[16] See Buendia, C. and D. Trew. 2017. *Lake Level Trends in the Sturgeon River Basin Bulletin (2017)*. Prepared for the North Saskatchewan Watershed Alliance, Edmonton, AB.

Major Lakes in the Sturgeon River Watershed
While there are numerous small 'kettle' lakes throughout the Sturgeon River watershed (formed by hydro-geological processes associated with the unique Carvel Pitted Delta), a few stand out for their importance for recreation and other opportunities.

Lake Isle
Lake Isle is an important recreational lake in the Sturgeon watershed and home to the Hamlet of Gainford and the Summer Villages of Silver Sands and South View. As well as boating and swimming, the lake is also popular for fishing. However, recreational activities can be limited by frequent blue-green algae blooms in the summer. Flowering rush, an invasive species, has also become a recent issue. See more about this lake in the Atlas of Alberta Lakes.

Lac Ste. Anne
Lac Ste. Anne was called "Manito Sakahigan" or "Spirit Lake" by the Cree people before Father Jean-Baptiste Thibault blessed the lake and renamed it Lac Ste Anne in 1842. Father Thibault also built a Catholic mission on the lake, and still today, the west end of the lake is considered a pilgrimage destination. See more about this lake in the Atlas of Alberta Lakes.

Matchayaw (Devil's) Lake
Matchayaw (Devil's) Lake is a small waterbody (with a lake area of about 2.11 km^2) east of Onoway. The Sturgeon River enters the lake from the northwest and exits from the north shore, contributing to relatively consistent lake levels. The community of Bilby is located on the south shore. The lake is a popular fishing site with sport fish including burbot, northern pike, walleye, whitefish, and yellow perch.

Big Lake
Immediately west of St. Albert, Big Lake is both fed and drained by the Sturgeon River. Long known as a significant birding area, the Alberta Government created the Big Lake Natural Area in May 1999 comprising 1,119 hectares of lake and wetlands. On June 5, 2001 Big Lake was designated an Important Bird Area . In 2005 Big Lake became Alberta's newest protected area, named Lois Hole Centennial Provincial Park.

Sandy Lake
West of Morinville, Sandy Lake is a transboundary lake, shared by the counties of Lac Ste. Anne and Sturgeon. Highway 642 crosses the top portion of the lake. The Summer Villages of Sandy Beach, Sunrise Beach, the Hamlet of Pine Sands, the Sandy Lake Wilderness Area and the Alexander First Nation Reserve are all situated on the lake's shoreline. Once a fishing destination, Sandy Lake has had almost no fish in it for years due to low nutrient -rich waters, dense vegetation and poor under-ice oxygen levels.

Manawan (Egg) Lake
Manawan (or Egg) Lake, about five km north of Morinville, is an interesting example of an aquatic ecosystem with multiple values, uses, and issues affecting its health. At one time, the lake was used as a drinking water source, and can still be an emergency source for the Town of Morinville. This area was designated as the Manawan Drainage District in the 1940s, as efforts to improve agriculture in the area were made. In the 1970s and 1980s, lake levels declined. A weir, built in 2004 by Ducks Unlimited Canada, restored water levels, making the lake globally significant as an Important Bird Area for staging, moulting and breeding waterfowl, shorebirds, gulls (particularly Franklin's gull and black terns) and other species. The weir, however, created some local flooding issues resulting in the province expropriating floodplain lands around the lake. Today the lake is still a part of a local drainage system. The Manawan Canal is a small channel that flows southwest from Manawan Lake to meet the Sturgeon River near Carbondale. The canal drains agricultural land north of the Town of Morinville. Today, the Manawan Drainage District, Ducks Unlimited and Alberta Environment and Parks continue to manage the lake and the weir.

- ***GOAL 3.3. Lakes and their surrounding watersheds are recognized as a highly valued, limited resource and managed such that they are healthy for current and future generations.***
    - ***Strategy 3.3.1.*** *Improve knowledge about the state of lakes in the Sturgeon watershed and issues affecting their health.*
        - Action: In conjunction with other 'state of' reporting (see strategy 3.1.1), identify and collect data on indicators of lake health and release in a timely fashion to inform decision-making.
    - ***Strategy 3.3.2.*** *Educate lake residents and visitors/users about their impacts and what they can do to lessen their footprint.*
        - Action: Working with the GOA Respect Our Lakes program, ensure the public and elected officials understand lake ecology, have realistic expectations of what a healthy Alberta lake looks like, and know what they can do to reduce their impact.
        - Action: Engage existing and support new lake watershed stewardship groups and stewardship programs and products (e.g., Nature Alberta's Living by Water).
    - ***Strategy 3.3.3.*** *Improve lake watershed management by aligning policies and regulations such that land use and recreation on the water and in the uplands do not irreparably harm the lake resource.*
        - Action: Develop land use bylaws and policies (e.g., pesticide and fertilizer bylaws, setback distances, building standards) that are consistent between municipalities that border a shared waterbody.
        - Action: Ensure the referral system between government regulators is working and development applications are being reviewed such that the cumulative effects of nutrient and sediment loading is reduced.

Potential Implementers: SRWA, NSWA, municipalities

Performance Measures:

- Lake health is maintained or improved.

Fisheries and Invasive Species Management at Lake Isle

At one time, Lake Isle supported a healthy fishery, with a number of large sport fish such as walleye, jackfish, burbot, whitefish and perch. However, in recent years, fishing has declined. Hence a Fisheries Restoration Program was initiated by ACA in 2015. This initiative included a stakeholder survey; an updated lake nutrient budget; water quality monitoring; and some habitat restoration work, with the ultimate goal to restock the lake with sport fish populations and restore recreational fishing capacity. More recently, Lake Isle has been tackling flowering rush, an invasive species that has spread along the shorelines of much of the lake. In 2018, a number of groups and volunteers made a concerted effort to hand pull this noxious weed. However, chemical treatment is probably required to completely eradicate this species and stop its spread further downstream into Lac Ste. Anne and the Sturgeon and North Saskatchewan Rivers. Alberta Environment and Parks, local stewardship groups, the Alexis Nakota Sioux Nation and others are working together to try and address this issue. Their learnings will be important to other communities facing similar threats from invasive species.

Lac Ste. Anne County – Land of Lakes

Lac Ste. Anne County is home to two large well-utilized recreational lakes, Lake Isle and Lac Ste. Anne, and several smaller lakes utilized for fishing and other recreational activities. The County, with a population of about 11,000, sees the value of this resource and maintains a number of polices and programs for managing its waterbodies. Lakes, and the recreational lands that surround them, are recognized in the County's municipal development plan (MDP), which includes a number of rules for development adjacent to waterbodies such as prohibiting shoreline vegetation removal or the creation of artificial beaches. Additionally, Lakeside residential sub-divisions greater than 10 units require an Area Structure Plan (fewer than 10 require a concept plan).

The County has also produced a number of map overlays that inform its decision-making including its environmentally sensitive areas, potential flood hazard areas, priority conservation wetlands, and priority vegetation conservation areas. In their Land Use Bylaw (LUB), lakes are managed as Lakeside Residential Districts: setback from any waterbody from 20 to 100m; environmental reserve is determined using the Riparian Setback Matrix Model; and lakeside parcels must retain 50% of existing vegetation and meet landscaping standards.

The County also manages a large agricultural landscape which can affect watershed health if not managed properly. In 2015, the Alternative Land Use Services Canada (ALUS) program debuted in Lac Ste. Anne County. Since then, ALUS has worked with numerous landowners to implement a number of projects such as installing off-site livestock watering systems, fencing off waterways from livestock, protecting riparian areas, planting native vegetation on degraded land, and installing beaver-friendly management devices. The goal of these projects is to reduce the impacts of flood and drought events on the landscape, improve water quality, enhance wildlife habitat, prevent soil erosion and loss, and increase biodiversity.

Finally, the County also collaborates with a number of smaller communities in the area. For example, the Town of Onoway is located at the junction of Highway 37 and Highway 43, immediately east of Lac Ste. Anne and south of the Sturgeon River. With a population of about 1,000 people, the Town's name is a transliteration of a First Nation equivalent of "rich, lush meadow" (See History of Onoway). Today, the Town itself is managed under several statutory documents including an IDP with Lac Ste. Anne County. The Town also recognizes a number of watershed features surrounding it including several small lakes (Chickakoo, Muir, Salter's Lakes), tributaries (Kilini Creek) and recreational areas (Imrie Park, Bilby Natural Area) (for more information on these areas, see the Stony Plain – Onoway Nature Tour website).

Outcome 4. The importance of water quantity is recognized and reliable, quality water supplies are available for people, livestock, and a sustainable economy.

SECURE WATER SUPPLIES

Although it only contributes about one percent (1%) of the flow of the North Saskatchewan River (as measured as a proportion of flow at the Alberta-Saskatchewan border), the Sturgeon River (as well as its associated lakes and tributaries) is an important water supply providing numerous local benefits such as:

- Water for agriculture (livestock watering including cow/calf, hog and dairy operations; large-scale poultry farming; crop irrigation including sod, potatoes, greenhouse and market gardens, tree and berry farms; crop spraying, etc.)
- Water for industry (e.g., gravel dewatering and washing) and commercial enterprises (e.g., golf courses)
- River flow and lake levels conducive to recreation (canoeing, hiking, fishing) and cultural activities
- Water to maintain the aquatic ecosystem health of numerous lakes, streams, and wetlands
- Water for ecological goods and services such as flushing flows, water and waste water conveyance downstream, waste dilution, moderating flood/drought, etc.

The Sturgeon River is a precipitation-fed river system (i.e., it does not receive any glacier melt). Winter precipitation, in the form of snow melt/spring surface run-off, is important for determining stream flows and lake levels, which generally peak during spring runoff and drop throughout the summer open water season. Summer precipitation is usually exceeded by evapotranspiration, leaving a moisture deficit. As the Sturgeon River flows through Lake Isle and Lac Ste. Anne, annual lake level variation, aquatic vegetation and beaver activity can all influence downstream river flow. Similarly, tributary flows, which are generally highly variable, can affect flows of the Sturgeon River mainstem.[17]

Under the *Water Act,* water allocation is managed by the Province, and aside from use for domestic purposes, users must have a licence or registration to withdraw water from any waterbody. In managing this resource, the Province balances supply and demand, making sure allocations don't exceed the amount of water flow that must remain in the lake or river for the protection of aquatic ecosystem health.

As each licence application is reviewed, approval is based on water availability. Licences may be granted with conditions that are protective of the river ecosystem. There are currently 2,641 water licences[18]

[17] For more information on water supply for the Sturgeon River, see the Figluizzi, S. 2017. Assessment of Existing Water Supply & Demand Data for the Sturgeon River Basin (2016). Also, see Buendia and Trew 92017) Lake Level Trends in the Sturgeon River Basin Bulletin (2017).

[18] Note that domestic use (up to 1250 cm per household per year or 3400 litres per household per day) does not require a water licence. For more information, see the Environmental Law Centre's Factsheet: Water Rights and Property Rights.

issued in the Sturgeon watershed; 64% are from surface water and 36% are from groundwater. Net annual allocation accounts for approximately 13% of the average annual water available in the watershed (including both surface and groundwater). However, most withdrawals occur during the warm summer months, potentially adding stress to instream flow needs, as the river is naturally drawing down during this time period.

Future climate change with warmer summer temperatures may further exacerbate low summer flows. It might also create greater demand for activities such as irrigation, particularly if agricultural activity is intensified. Demand for surface water may also increase due to increasing industrial and commercial development in such areas as the Industrial Heartland, Industrial Parks, Villeneuve Airport, etc.

Land uses (e.g., clearing, wetland drainage, floodplain development, stormwater run-off) as well as interactions between surface water and groundwater also influence run-off and flow patterns. Hence, municipal land managers also have a role to play in meeting water quantity goals in low flow years, as well as managing excess waters in high flow years such as those seen in 2019.

- **GOAL 4.1. Water supply is managed effectively to support aquatic ecosystems, communities and the economy.**
    - ***Strategy 4.1.1.*** *Collaborate with the province, academia and others to fill information gaps on the Sturgeon River mainstem and its major tributaries including seasonal instream flow needs (IFN) and aquatic health needs, current water use and future demand and supply.*
        - Action: Examine existing data and estimates around domestic entitlements, agricultural registrations, licenced water allocations, actual use/consumption and compare to instream flow needs calculations.
        - Action: Encourage all licencees to accurately and consistently report actual water use through the GOA Water Use Reporting System.
        - Action: Maintain existing mainstem gauges and seek funding to establish more gauging stations on tributaries to improve water balance calculations and determine long-term trends in lake levels/river flows.
        - Action: Explore the most appropriate method of calculating IFNs and calculate IFNs under current and anticipated future conditions. If/where required, use the appropriate regulatory tools to limit water withdrawals during low flow periods for the protection of aquatic ecosystem health.
    - ***Strategy 4.1.2.*** *Ensure water supply meets future growth and demand.*
        - Action: Ensure the economic value of water as well as trade-offs are understood and inform local and regional decision-making.
        - Action: Identify and promote beneficial practices, incentives and other tools that encourage water conservation and reduce water use by agriculture, industry, municipalities and the public.

Potential Implementers: NSWA, SRWA, AEP, EMRB, AUMA, RMA, water allocation licensees, agricultural producers

Performance Measures:

- Instream flow needs are met in the Sturgeon watershed.
- Water conservation targets (for household, municipalities, industry etc.) are met.

Understanding Water Quantity in the Sturgeon River Watershed

To improve our understanding of water quantity in the Sturgeon River watershed, the SRWA and its partners commissioned several reports. In 2016, the *Assessment Of Existing Water Supply And Demand Data For The Sturgeon River Basin* (Figluizzi 2017) examined the hydroclimatic data, water use data and a water management model suitable for the Sturgeon watershed. This report also made several recommendations on work required to update and/or improve the reliability of the data for future water quantity modelling.

Continuing the investigation of water quantity, in 2017, the NSWA produced the Technical Bulletin - *Influence of Climate, Landscape Change and Licenced Water Removal on Flows in the Sturgeon River Basin*. This bulletin provides an overview of the temporal changes in river flows and water supply in the Sturgeon River and analyzes the main drivers causing these changes. The document notes that flows in the Sturgeon River have decreased significantly over the past few decades following a rapid expansion of urban areas and changes in land use across the basin. However, it also noted that there are many uncertainties with respect to water supply in the Sturgeon River. Within a context of climate change and continued economic and population growth, it is crucial that we gain an understanding of which drivers are having the most impact on the Sturgeon River flows. Water quantity is also a concern for lake users in the watershed. Hence the NSWA produced a second Technical Bulletin *Lake Level Trends in Alberta* (Buendia and Trew 2017) This document showed that lake level trends are different for different lakes, and can vary significantly over time.

Finally, in order to understand how changes in land cover and land use are affecting watershed resiliency measured as hydrology, the SRWA commissioned ALCES to model the watershed. This work, as reported in *An Identification and Evaluation of Strategic Priorities for Conservation and Restoration to Improve Watershed Resiliency in the Sturgeon River Watershed (Macdonald et al. 2019)* showed that wetland restoration has the greatest potential to restore flows in the watershed.

Outcome 5. ***Wise land use ensures the cumulative effects of growth and development are mitigated, the land is resilient to climate change, and individuals and communities are well prepared for flood and drought events.***

WISE LAND USE

Decisions about protecting natural land cover or using the land for activities such as agriculture, urban expansion, or industry, can affect how water moves (water quantity) over the landscape as well as what it carries (water quality) downslope to the nearest waterbody. Additionally, land use development decisions that result in the loss or impairment of riparian habitat, wetlands and floodplains can also affect water quantity and quality. Finally, land use decisions can also affect how the public access water bodies for cultural, recreational and other purposes.

Because of its potential impact on the water resource, land use planning must be well informed, and its cumulative impacts considered at the watershed level. The Sturgeon River watershed is a highly developed landscape. Currently, land cover in the Sturgeon watershed is largely made up of agricultural lands. However, urban development is the fastest growing land use. Overall, the watershed is composed as follows:

- Approximately 20% of lands under natural cover (forests, wetlands, lakes, etc.)[19]
- About 70% of lands used for agricultural activities (crops and livestock)
- The remaining 10% of lands are 'developed': i.e., it is either urban area or another linear disturbance such as roads, pipelines, right of ways, industrial parks, gravel mines[20])

Land use decision making in itself is complex. Adding to this complexity is the need to understand how land use decisions made today affect watershed health in the future. Towards this end, the SRWA commissioned the development of a model as described in the report *An Identification and Evaluation of Strategic Priorities for Conservation and Restoration to Improve Watershed Resiliency in the Sturgeon River Watershed* (Macdonald et al. 2019). This and other work have informed the following goals, strategies and actions.

- **Goal 5.1. The cumulative effects of land use detrimental to watershed health are understood, considered in decision-making processes, and where possible, addressed.**
    - ***Strategy 5.1.1.*** *Protect important areas of existing natural land cover, such as wetlands, riparian areas, key groundwater recharge areas and key habitat and wildlife corridors in the Sturgeon watershed.*

[19] For more on natural areas remaining in the sturgeon watershed, see Natural Areas Mapping For The Sturgeon River Watershed (2019) (Marcotte et al. 2019)

[20] For more on gravel mining, se the NSWA's *Information Bulletin Gravel Operations in the Sturgeon River Watershed (2018)*

- Action: Compile existing or commission new maps showing important areas of natural cover/environmentally significant areas and ensure this data is available to municipal planners and decision-makers.

- ***Strategy 5.1.2.*** *Use land use planning and development processes to ensure built landscapes maximize water capture, infiltration and slow release (through protection and restoration of riparian areas, wetlands and floodplains and through stormwater management best practices).*

  - Action: Promote LEED standards and low impact development (LID) principles that integrate with the environment.

  - Action: Identify and prioritize areas where there is more value from LID, or where different LID elements are more useful (e.g. enhanced infiltration will be less useful in areas dominated by shallow clay sediments).

  - Action: Conduct a study to see what the impacts would be of developing a conservation and protection zone along each side of the Sturgeon River with limited types of development (e.g., No hazard waste transfer, landfill, lagoon, refinery, salt yard, any facility handling contaminants of concern, etc.) allowed within the corridor.

- ***Strategy 5.1.3.*** *Promote a stewardship ethic and increase the adoption of best management practices for agricultural lands and acreages.*

  - Action: Support programs like (but not limited to) ALUS Canada, the Land Stewardship Centre's Green Acreages Program and Alberta's Environmental Farm Plan program.

Potential Implementers: SRWA, NSWA, municipalities

Performance Measures:

- Maintain or improve percent of the watershed with wetland, forest, or riparian areas.
- Number of agricultural BMP stewardship projects undertaken.
- Number of municipalities that have stormwater release rates that are the same or lower than pre-development rates.

What do we mean by "Low Impact Development Principles" for Stormwater Management?

Low Impact Development (LID) is generally considered a more environmentally friendly way of managing stormwater runoff closer to its source, ensuring less runoff and better-quality water reaches the receiving water body. LID attempts to manage rainfall at the source through site planning and physical infrastructure that mimic natural hydrologic characteristics. Some examples of management tools include limiting non-permeable areas, green roofs, rain gardens, permeable paving, rain barrels or cisterns and native plant landscaping in priority areas such as groundwater recharge areas and lots adjacent to water bodies. A wide body of knowledge is available around LID techniques that offer proven, effective, and affordable options to mitigate the environmental impacts of urbanization. The City of Calgary and City of Edmonton have comprehensive LID guidelines available for developers. Consistent terminology, standards and guidelines are important for achieving beneficial outcomes for all.

City of Edmonton's Land Use Planning around Big Lake

Although only a small portion of the Sturgeon River watershed (including a portion of the south shore of Big Lake) falls within the jurisdiction of the City of Edmonton, a great deal of planning has gone into residential development in this area. The City produced the Big Lake Area Structure Plan in 1991 and followed up with five neighborhood plans (Trumpeter 2008, Hawks Ridge 2010, Starling 2010, Kinglet Gardens 2016 and Pintail Landing 2019). The City of Edmonton was also a partner in the 2004 Big Lake Stormwater Master Plan and continues to research innovative approaches to reducing run-off volumes. The City's *River for Life* program provides public education around low impact development principles, stormwater management and river health.

Sturgeon County – Keeper of the Lower Sturgeon

As the name suggests, the Sturgeon River plays a major role in Sturgeon County, with a good portion of the lower mainstem located in this municipality. Additionally, a number of smaller tributaries (e.g., Rivière Qui Barre and Little Egg Creek) drain county lands in the north, south to the Sturgeon River. Additionally, the mouth of the Sturgeon River (where it meets the North Saskatchewan River), an area important for fish and other biodiversity, occurs within Sturgeon County boundaries.

Recognizing this important relationship with its namesake, Sturgeon County, with a population of approximately 20,000 residents, is guided by a strategic plan that lists environmental stewardship as one of five key focus areas. However, the county also has a significant agricultural and industrial footprint it must balance with environmental outcomes. To achieve this balance, Sturgeon County relies on its MDP and LUB, as well as a number of other strategic tools, to guide the County's growth and development.

To support its agricultural community, the county maintains an Agricultural Services Board that promotes the adoption of sustainable agricultural practices. They county is also participating in the EMRB's initiative to develop a Regional Agricultural Master Plan.

A portion of Alberta's Industrial Heartland, an area of chemical, petrochemical, oil and gas investment, lies on the eastern edge of the county. Gravel extraction operations are an important activity in the west. Development in both areas are guided by the County's Area Structure Plans.

Sturgeon County also recognizes the need to work with its neighboring municipalities including Gibbons, Bon Accord and Morinville. The County consults with these neighbors on planning initiatives and may use *joint use agreements* to make effective use of community facilities and programs. The County also has an Intermunicipal Affairs Committee to discuss shared interests and issues with its St. Albert neighbor. Working together, these municipalities recognize the value and are realizing the opportunities associated with maintaining the integrity of the Sturgeon River valley and its surrounding uplands.

CLIMATE CHANGE PREPAREDNESS

Most municipalities in Alberta have dealt with flood and/or drought conditions at one time or another and the municipalities in the Sturgeon watershed are no different. Municipalities are also increasingly aware of climate change, and how the frequency of large weather events may be changing. Topics such as air quality, energy efficiency and green house gas reduction are being discussed by municipalities and other stakeholders in the Sturgeon River watershed. The effects of climate change might also impact our land use decision-making as we look at the resiliency of the watershed and its ability to withstand an increase in floods, droughts or other climatic extremes.

- **Goal 5.2: The effects of climate change on the Sturgeon watershed are understood and mitigated.**
    - ***Strategy 5.2.1.*** *Build awareness and knowledge about the impacts of climate change on the Sturgeon River watershed.*
    - ***Strategy 5.2.2.*** *Promote flood/drought preparedness to agriculture, industry, municipalities, Indigenous communities and the public.*
    - ***Strategy 5.2.3.*** *Promote energy efficiency and other air quality and carbon reduction strategies.*

Potential Implementers: SRWA, NSWA, municipalities with help from AUMA, RMA

Performance Measures:

- air quality indicators, carbon indicators, number of flood hazard mapping studies, etc.
- GHG emissions, energy efficiency grants, mitigation or adaptation plans

Outcome 6. ***Residents and stakeholders support the Sturgeon River Watershed Management Plan and are willing to participate in local and regional initiatives to improve watershed health.***

ENGAGED RESIDENTS

It is important that the public support the work of municipalities and the SRWA. It is also important that residents in the basin have the knowledge, skills and tools to be good stewards of the watershed. However, the public are not always aware of water issues or the impacts their actions have on the watershed. Hence, education and outreach should be a key component of the SRWMP. The SRWMP should provide opportunities for residents to engage in hands-on stewardship activities that build an appreciation and awareness of the Sturgeon watershed.

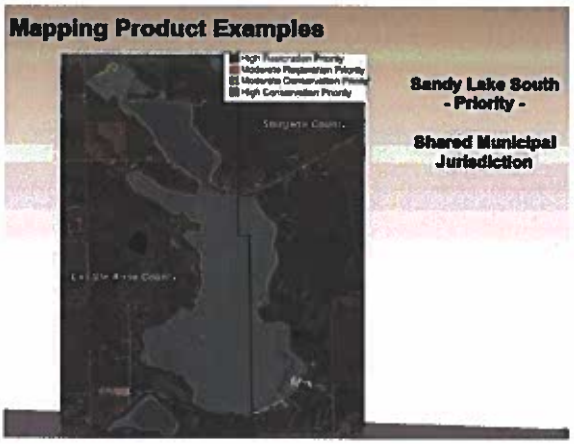
"Whether it's drought or fires, inundation or erosion, what happens at the local scale matters. That's where the impacts affect individual lives. That's where what people do in their communities can help us cope with the consequences of a warming world." Lauren E. Oakes, Confronting flames, floods and more in a warming world. Scientific American Blog August 2, 2019.

- **Goal 6.1. Residents are engaged in watershed management through education, outreach and stewardship opportunities.**
    - ***Strategy 6.1.1.*** Building on the GOA's water literacy program, develop an education and outreach strategy specific to the Sturgeon watershed and its stakeholders.
        - Action: Align key messages and develop shared materials on key watershed issues (riparian health, lakeshore issues, wetland loss, water quality, invasive species, etc.) between GOA, NSWA, SRWA municipalities and NGOs.
        - Action: Continue to maintain a dedicated SRWA webpage as a central hub for posting SRWMP updates, reports, FAQ sheets, etc.
        - Action: Facilitate regular SRWA forums to report on progress of SRWA SRWMP and / or participate in major municipal events to share information on SRWMP implementation.
        - Action: Provide opportunities for improving understanding of Indigenous values and traditional knowledge.
    - ***Strategy 6.1.2.*** Engage the public through hands-on learning and stewardship activities by supporting the formation and maintenance of stewardship groups such as Big Lake Environmental Support Society (BLESS), Lake Isle and Lac Ste. Anne Water Quality Management Society (LILSA), local Fish and Game Clubs, etc.
        - Action: Provide financial, technical and other support to BLESS, LILSA, local Fish and Game clubs and other stewardship and conservation groups to carry out education and activities such as shoreline clean-ups, riparian plantings and invasive plant monitoring.
    - ***Strategy 6.1.3.*** Celebrate and communicate successes.

Potential Implementers: SRWA, NSWA, municipalities, GOA, conservation and stewardship groups
Performance Measures:

- Water literacy of residents in the Sturgeon watershed is improved.

Watershed management, particularly where water bodies cross jurisdictional boundaries, or in areas of intense development pressure, is challenging. Individually, few municipalities have the time or resources to tackle all watershed issues. Fortunately, collaborating, sharing and leveraging resources, and learning from one another, can help fill gaps in capacity for effective watershed management.



Sandy Lake is a good example of a transboundary water body, with both Lac Ste. Anne and Sturgeon counties responsible for development around the lake's perimeter.

The SRWA, as a group of municipalities and other interested parties working together, has been very effective in the past in filling information gaps and building momentum and support for developing the SRWMP. Now they must turn their attention to SRWMP implementation through the continued use of inclusive governance combined with empowered local decision-making supported by sustainable funding.

- **Goal 6.2: The SRWA is representative, well attended and effective at using a collaborative approach to implement the SRWMP.**
    - ***Strategy 6.2.1.*** Continue to provide a platform for the province, municipalities, Indigenous communities, NGOs, industry and other stakeholders to collaborate on SRWMP implementation through participation on the SRWA Steering and Technical Committees.
        - Action: Provide support such that the Steering Committee meets a minimum of three times a year to oversee and report on SRWMP implementation.
        - Action: Provide support such that the Technical Committee meets a minimum of four times a year to address information gaps and technical issues with implementation.
        - Action: Develop a workplan and budget and apply for municipal and other grant funding to support the work of the Steering and Technical Committees.
        - Action: Encourage Indigenous communities, agriculture and industry to participate on the Steering and Technical Committees or their initiatives.
        - Action: Prepare an annual report on SRWMP implementation progress and present it to municipal councils and other interested stakeholders.

Potential Implementers: NSWA, SRWA, municipalities, GOA

Performance Measures:

- Regular meetings of the SC and TAC are well-attended by all jurisdictions and stakeholders.
- In-kind contributions by SRWA members

PLAN IMPLEMENTATION

As many people have noted, it took a long time for the Sturgeon River watershed to get into the condition it is in, and it will take a long time to address the many issues affecting it. Hence, the SRWMP is meant to provide guidance over the long term, with a vision and goals that look outward for at least the next 25 years.

However, participants also expressed an eagerness to get busy, asking what can be done today and in the near future to improve watershed health. Hence, the plan also includes a number of strategies and actions that can be implemented over the next 5–10 years. Strategies, actions and performance measures will be refined as the plan is implemented and as more knowledge becomes available to inform our activities.

BASIN-WIDE SRWA PRIORITIES

To be successful, SRWA members will need to continue to work together to find capacity and tools for plan implementation. Even with this leveraging, resources will continue to be limited, hence it is imperative that priorities are identified, agreed to, and acted on as capacity allows.

Ideally, progress should be made on all six key outcomes, as they are interrelated and all required to achieve the plan's vision. However, some strategies and actions may be more beneficial to implement sooner than others. Additionally, some strategies are better implemented using the SRWA basin-wide collaborative approach, while others are more suited to implementation by a single jurisdiction or local partnership.

While additional strategies will be addressed by the SRWA as time and resources permit, the Steering Committee has identified five basin-wide priority strategies (Figure 4) that it will begin implementing collaboratively in the short term. These include the following:

1. Undertaking policy review and alignment work (*Strategy 1.1.2*).
2. Developing a watershed monitoring, evaluation and reporting framework (*Strategy 3.1.1*).
3. Developing and implementing a riparian and wetland strategy (*Strategy 3.2.2*).
4. Striking a small working group to resolve water quantity knowledge gaps (*Strategy 4.1.1*).
5. Continuing to use the SRWA platform to engage others (*Strategy 6.2.1*).

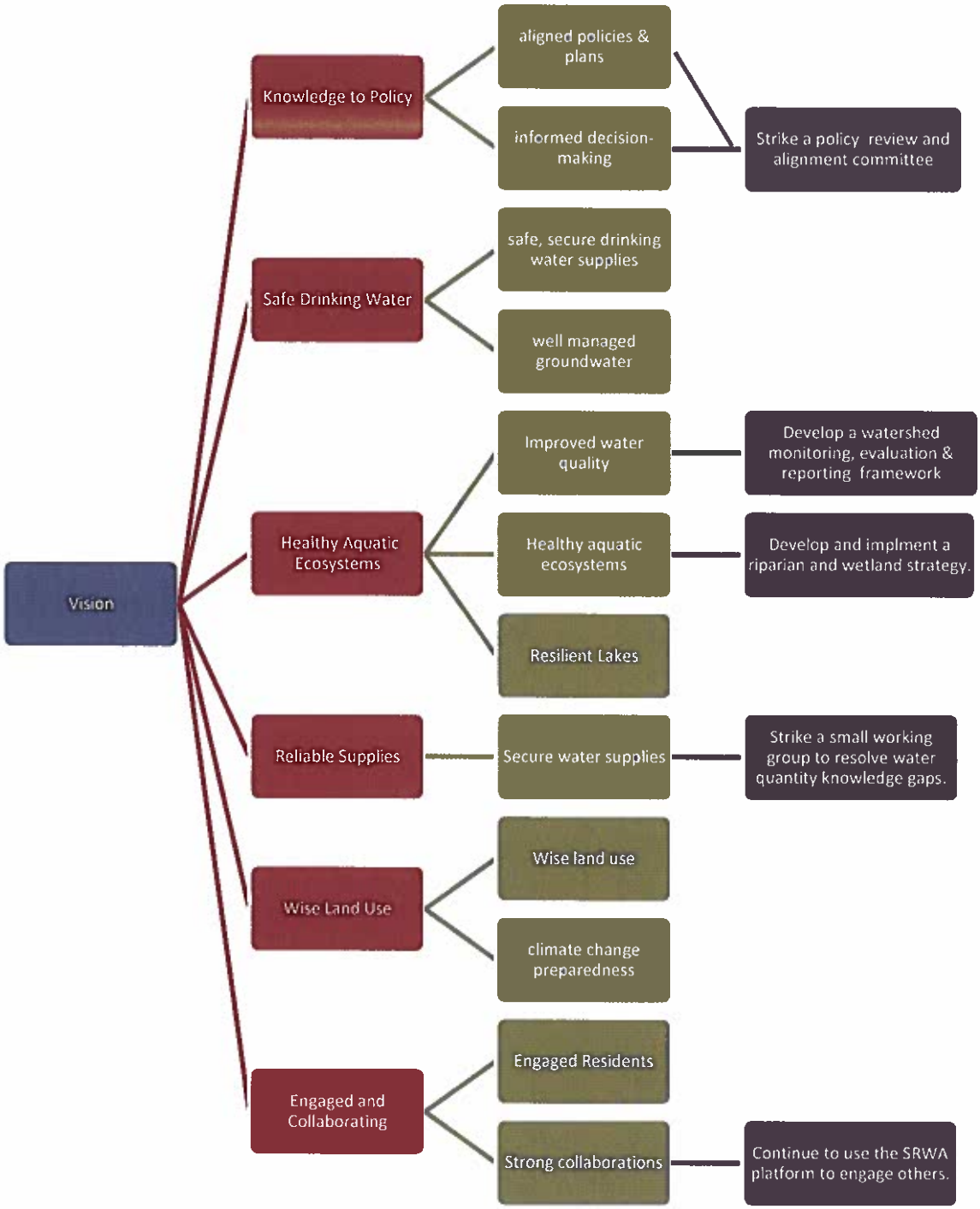


Figure 4. Vision (blue), outcomes (red), goals (green) and priority strategies (purple) of the SRWMP to be implemented collaboratively in the short term through the work of the SRWA.

PLAN PRIORITIES BY RIVER REACH, TRIBUTARY AND JURISDICTION

In addition to having basin-wide implementation strategies, SRWA members asked that the SRWMP also identify priorities in each region and/or jurisdiction. Most municipalities are already engaged in several aspects of water and watershed management. To support the SRWMP, municipalities can continue to support activities that achieve the following:

- Ensuring safe, secure drinking water supplies from both public and private surface and groundwater sources (*Strategies 2.1.1 and 2.1.2*);
- Ensuring wise land use planning and management (Strategies 5.1.1 and 5.1.2) and climate change preparedness (Strategies 5.2.2 and 5.2.3); and
- Engaging residents (Strategy 6.1.2).

Additionally, looking at issues on a local basis, individual municipalities, time and resources permitting, might continue to focus, or renew focus on, the following local priorities:

UPPER HEADWATERS REACH (ABOVE LAKE ISLE) / PARKLAND COUNTY

- Improving water quality and river flow in the headwaters of the Sturgeon River (above Lake Isle and the headwaters of Kilini and Atim Creeks) through education and incentive programs aimed at encouraging private landowners (including agricultural producers and acreage owners) to conserve and restore natural land cover including woodlands, wetlands and riparian areas (*Strategy 5.1.3*).
- Considering a headwaters conservation zone with limited types of development and adequate setbacks.

RECREATIONAL LAKES (LAKE ISLE, LAC STE. ANNE AND SANDY LAKE) / LAKE COMMUNITIES

- Managing invasive species (*Strategy 3.2.4*).
- Reducing nutrient and contaminant lake loading by implementing policies and regulations such as cosmetic pesticide and fertilizer bylaws, setback distances, building standards for lakeshore and near-shore development, etc. (*Strategy 3.3.3*).
- Conserving and restoring natural cover along lakeshores (Strategies 3.2.2. and 5.1.1.).

UPPER RURAL REACH (RURAL AREA BELOW LAC STE. ANNE AND ABOVE BIG LAKE) / LAC STE. ANNE COUNTY, ONOWAY, STURGEON COUNTY, WESTLOCK COUNTY

- Promoting a stewardship ethic and beneficial management practices on agricultural and country residential lands around Toad Creek, the middle reaches of the Sturgeon River above Big Lake, and the Rivière Qui Barre drainage (Strategy 5.1.3.).

MIDDLE URBAN REACH /SPRUCE GROVE, STONY PLAIN, ST. ALBERT, EDMONTON

- Reducing the impact of urban development around Big Lake and its tributaries (including Atim and Carrot Creeks) through collaborative municipal efforts for stormwater management, low impact development, etc. (*Strategy 5.1.2.*).

LOWER RURAL REACH (DOWNSTREAM OF ST. ALBERT TO THE CONFLUENCE INCLUDING EGG LAKE DRAINAGE)/ MORINVILLE, STURGEON COUNTY

- Improving awareness of the importance of riparian lands and wetlands on an agricultural landscape, as well as the resources available to producers to implement beneficial management practices to reduce contaminant loading, protect and restore riparian areas and wetlands (*Strategies 3.2.2., 5.1.1. and 5.1.3.*).

CONFLUENCE REACH / STURGEON COUNTY, GIBBONS

- Work with local stakeholders (Sturgeon County, Industrial Heartland, Town of Gibbons, recreation groups, landowners, land trusts, etc.) to protect high value fish habitat and biodiversity in this area (*Strategy 5.1.1.*).

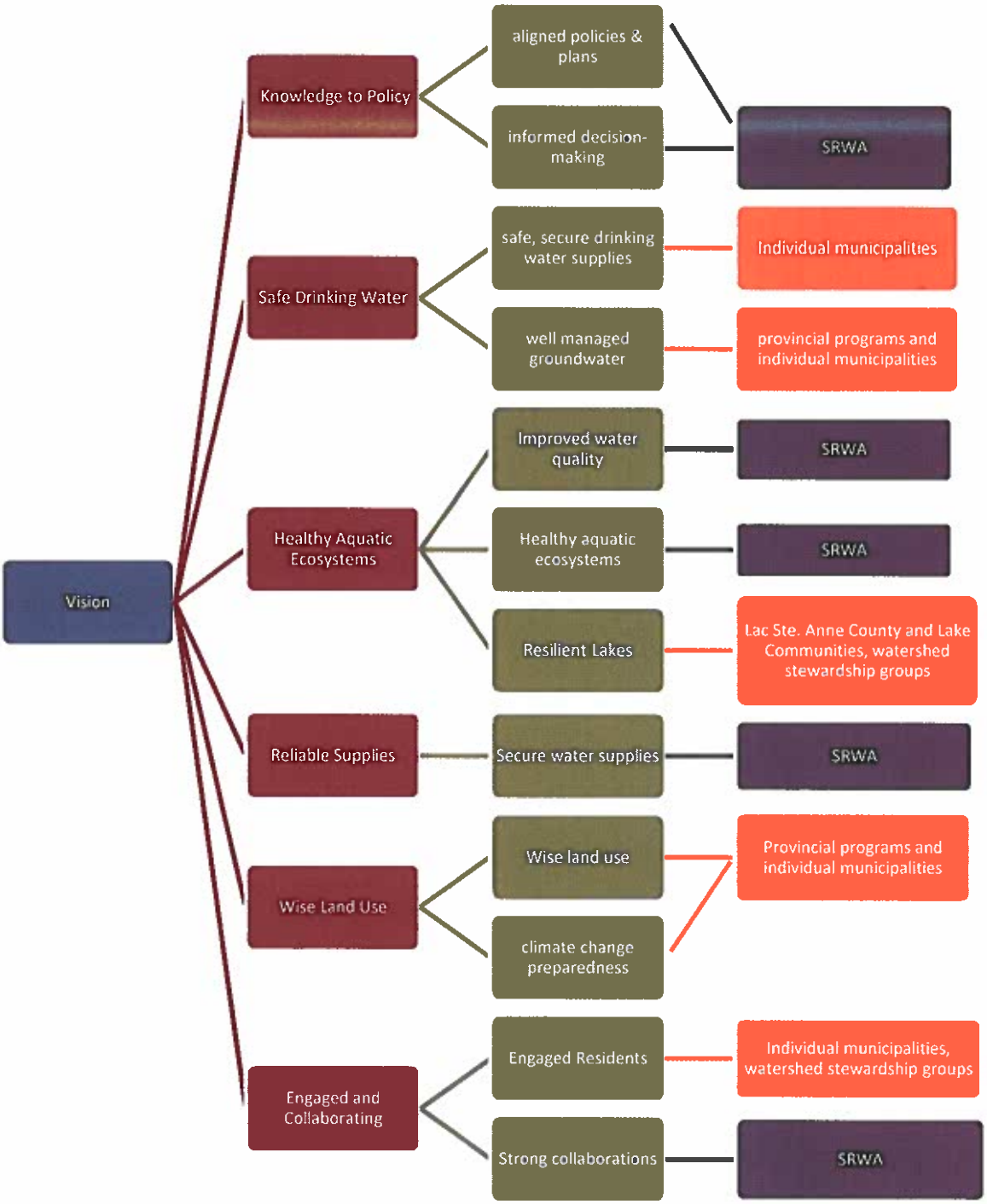


Figure 5. Vision (blue), outcomes (red), goals (green) and priority strategies (orange) of the SRWMP to be implemented through the ongoing work of individual municipalities and programs.

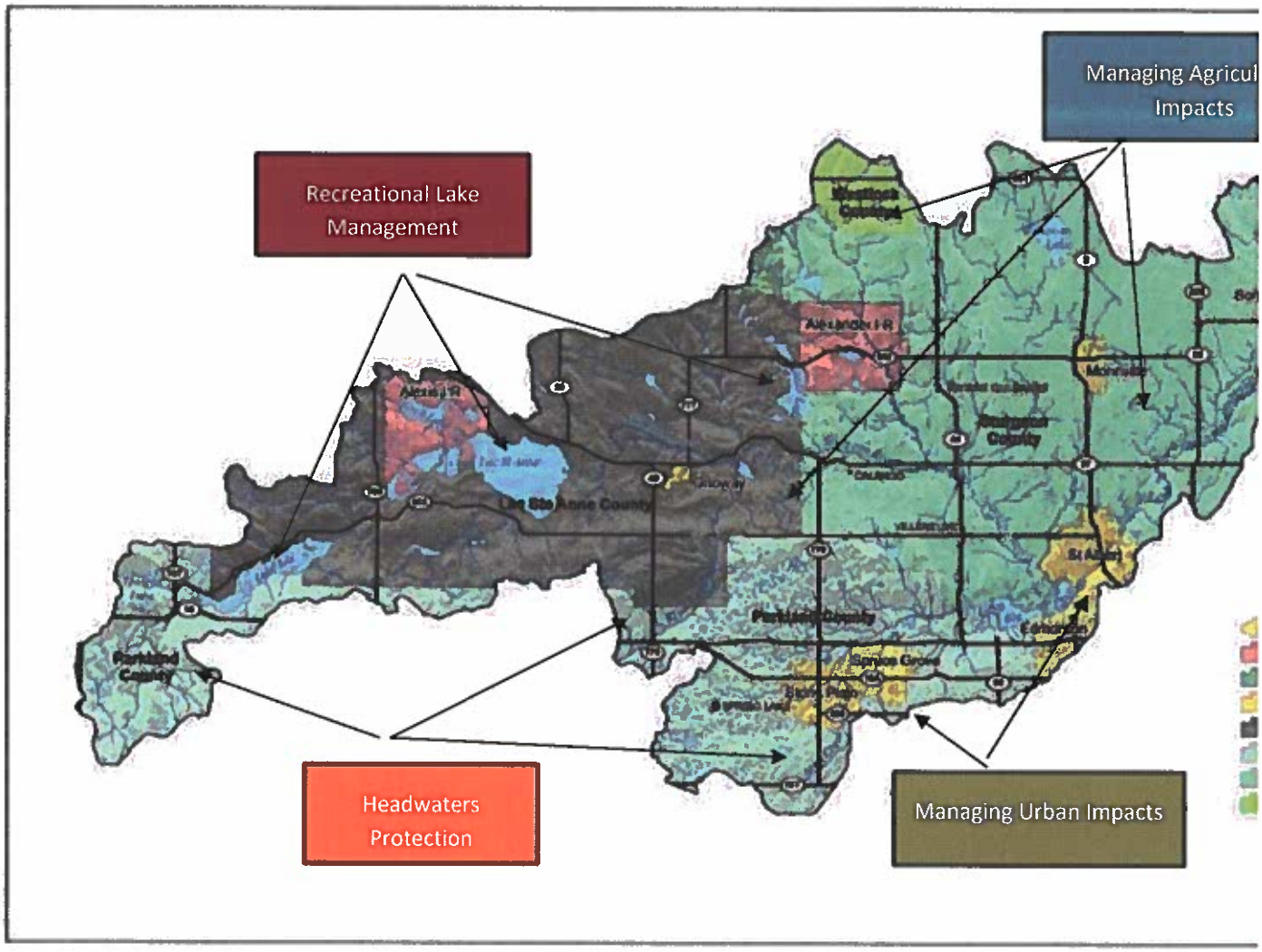


Figure 6. There are different issues and different priority strategies in different parts of the Sturgeon watershed.

PLAN REPORTING AND REVIEW

For watershed management plan implementation to succeed, a performance management approach is required. This approach includes reporting on the completion of outputs. It also includes reporting on the progress made towards the successful achievement of desired outcomes (i.e. vision, goals, targets, etc.), as measured by a suite of performance measures or metrics. Hence progress on both outputs and outcomes of the Sturgeon River Watershed Management Plan will be reported on annually, within the NSWA annual reporting process.

Additionally, watershed management plans are meant to be 'living' documents, in that the conditions leading to their development may change over time and the plans themselves, may need to be updated from time to time to address these changes. Hence the SRWMP will be reviewed by the SRWA Steering Committee every four years (one year after municipal elections), or as needed in response to a significant event, to ensure the plan remains relevant and timely.

IN CLOSING

This watershed management plan has been a collaborative effort by a number of jurisdictions and organizations, each concerned with the health of the Sturgeon River watershed. As such, it is but one step in the adaptive management process. To be successful in the next step of plan implementation, sustained effort by all jurisdictions within the watershed is required.

Fortunately, through the continued work of the SRWA, jurisdictions in the watershed have a strong foundation of sharing knowledge and collaborating to find solutions. These traits will continue to serve the organization and its members well as they move to the next phase of watershed management, and as they widen their circle to engage others in achieving their shared vision for the Sturgeon River watershed.

APPENDICES

APPENDIX 1. STEERING AND TECHNICAL COMMITTEE MEMBERS

Past and Present SRWA Steering Committee Members		
Name	Surname	Affiliation
Rebecca	Balanko	Town of Morinville
Judy	Bennett	Alternate, Town of Stony Plain
Dan	Derouin	Sturgeon County
Angela	Duncan	Village of Alberta Beach
Nick	Gelych	Lac Ste. Anne County
Jacquie	Hansen (Vice-chair)	City of St. Albert
AnnLisa	Jensen (Chair)	Parkland County
Jocelyn	Johnson	Alternate, City of Edmonton
Lisa	Johnson	Town of Onoway
Leah	Kongsrude	North Saskatchewan Watershed Alliance
Melissa	Logan	Support, City of St. Albert
Arin	MacFarlane-Dyer	Alberta Environment and Parks
Eric	Meyer	Town of Stony Plain
Jay	Millante	Town of Gibbons
Aaron	Paquette	City of Edmonton
Bernie	Poulin	Summer Villages of Lac Ste. Anne & County East
Wayne	Rothe	City of Spruce Grove
Petra	Rowell	North Saskatchewan Watershed Alliance
Pat	St. Hilaire	Alternate, Town of Onoway
Lynne	Tonita	Town of Onoway

Past and Present SRWA Technical Committee members		
Name	Surname	Affiliation
Achyut	Adhikari	City of Edmonton
Peter	Aku	Alberta Conservation Association
Bridget	Bull	Alexis Heritage and Language
Miles	Constable	Big Lake Environmental Support Society
Rachel	Davies	Sturgeon County
Natasha	De Sandi	Sturgeon County
Matthew	Ferris	Lac Ste. Anne County
Brendan	Ganton	Alberta Conservation Association
Patrick	Inglis	City of Spruce Grove
Bevan	Janzen	Alexis Heritage and Language
Mike	Klassen	Sturgeon County
Leah	Kongsrude	North Saskatchewan Watershed Alliance
Melissa	Logan	City of St. Albert
Arin	MacFarlane-Dyer	Alberta Environment and Parks
Jason	Madge	Town of Onoway
Krista	Quesnel	Parkland County
Michael	Silzer	City of Edmonton
Lorraine	Taylor	Lac Ste. Anne County
David	Trew	North Saskatchewan Watershed Alliance
Rachelle	Trovato	Parkland County
Petra	Rowell	North Saskatchewan Watershed Alliance
Robin	Beukens	City of St. Albert
Christian	Benson	City of St. Albert
Dianne	Allen	Town of Bon Accord
Alex	Oiffer	Alberta Environment and Parks
Louise	Verstegg	Parkland County

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Drinking Water:

Operator Consortium Report: Lac St. Anne and Parkland Counties
https://open.alberta.ca/publications/operator-consortium-report-lac-ste-anne-and-parkland-counties

First Nations On-Reserve Source Water Protection Plan
https://www.aadnc-aandc.gc.ca/eng/1398369474357/1398369572276

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Water quality management in Lac Ste. Anne and Lake Isle: a diagnostic study
https://open.alberta.ca/publications/0778540081 (final report, Mitchell);
https://open.alberta.ca/dataset/4b69a3c5-d606-47cb-82e4-2ee7578d8638/resource/58a3cb9b-e90f-4de4-8a6d-8043a1ad13d1/download/7979.pdf (interim report - Trew and Mitchell)

APPENDIX 3. STURGEON RIVER WATERSHED MANAGEMENT PLAN - 10 YEAR WORKPLAN

Goals	Strategies	Short Term Actions (2020 – 2022)	Longer Term Actions (as time a resources permit)
Outcome 1. Policies and plans are well-informed and align to support a healthy watershed.			
1.1. Policies, plans and management actions are aligned to sustain the health of the Sturgeon River watershed. Potential Implementers: NSWA, SRWA, GOA, municipalities	1.1.1. Incorporate values that support watershed health into federal, provincial, regional, municipal, resource and other policies, plans and actions by ensuring a watershed 'voice' is present in all policy and planning processes affecting the Sturgeon River watershed.	Action: Submit the SRWMP to the GOA as information to inform its development of the North Saskatchewan Regional Plan (NSRP) as well as other relevant provincial initiatives.	Action: Continue to work with othe municipalities though Alberta Urba Municipalities Association (AUMA) Rural Municipalities of Alberta (RM and Alberta Water Council process bring attention to the role of municipalities in watershed management.
		Action: Submit the SRWMP to the Edmonton Metropolitan Regional Board (EMRB) as information for their consideration and continue to encourage partnering on future policy and planning projects.	Action: Encourage individual municipalities to use the SRWMP t inform their own municipal policy planning over time and as their documents and processes are deve and renewed.
	1.1.2. Encourage policy and plan alignment by ensuring technical water and watershed information informs the development of policies, plans and other management tools (e.g., bylaws, districting, reserves, setbacks, standards, map overlays, definitions).	Action: Identify policy and planning gaps between municipalities in the Sturgeon River and adjoining watersheds and compare, develop and share model policy statements, bylaws, definitions and other tools to fill such gaps and resolve differences (e.g., septic bylaws, pesticide bylaws, setback definitions). Action: Recognizing the value of riparian intactness in securing water quality, make it a priority to work towards development of consistent policies and tools in protecting water bodies and riparian buffer setback within the watershed.	Action: Wherever possible, develo share spatial overlay maps (flood h areas, wetlands, natural areas, ripa setbacks, groundwater recharge/ discharge areas) to inform land use planning and development proces

Goals	Strategies	Short Term Actions (2020 – 2022)	Longer Term Actions (as time a resources permit)
1.2. Decision-making in the Sturgeon River watershed is based on the best available knowledge. Potential Implementers: NSWA, SRWA, GOA, municipalities, Indigenous communities	1.2.1. Identify, prioritize and fill information gaps, using both Indigenous knowledge and Western science, about the watershed.	Action: Work with Indigenous communities to create opportunities to identify and appreciate Indigenous knowledge or ways of knowing and values related to the Sturgeon watershed. Action: Building on existing monitoring programs (e.g., City of St. Albert, Creek Watch, Alberta Lake Management Lake Watch program), establish a watershed-wide monitoring, evaluation and reporting framework.	Action: Develop a research strateg identifies and prioritizes informatic gaps and methods to fill such gaps.
	1.2.2. Continue to develop and utilize mechanisms (e.g., meetings, workshops, Council presentations, reports, newsletters, technical studies, success stories and case studies, gap analysis) to share information to ensure decision-makers and others are well-informed about technical water issues in the Sturgeon watershed.	Action: Continue to engage the Province and municipalities (i.e., elected officials, senior management and technical staff) on key watershed issues through ongoing SRWA Steering and Technical Committee meetings, forums, workshops, publications, etc. Action: Provide guidance to municipalities on best practices around water management (e.g., stormwater management, low impact development, riparian restoration, etc.).	

Goals	Strategies	Short Term Actions (2020 – 2022)	Longer Term Actions (as time a resources permit)
Outcome 2. All residents have access to safe, secure drinking water supplies, whether they are on public or private systems or groundwater.			
2.1. Residents in the Sturgeon watershed have access to safe, secure drinking water supplies. Potential Implementers: SRWA, NSWA, municipalities private system operators, AEP, Alberta Health	2.1.1. Improve understanding of the current state of drinking water demand and supply systems including both public and private sector and the issues residents are encountering with these systems.	Action: Encourage municipalities to use surveys, workshops and other means to better understand private water systems (including wells, dugouts and cisterns) and the issues residents are encountering with these systems.	
	2.1.2. Promote source water protection.	Action: Ensure the public are knowledgeable about private drinking water system management and potential impacts to water supplies by encouraging participation in Alberta's Working Well Program and Drinking Water testing programs.	Action: Provide educational materi and promote agricultural, househo and commercial beneficial manage practices to protect source water quality.
2.2. Groundwater is understood and managed sustainably. Potential Implementers: SRWA, NSWA, GOA, AGS, municipalities	Strategy 2.2.1. Improve our knowledge about the quality and quantity of groundwater in the Sturgeon watershed and how it interacts with surface water.	Action: Encourage the GOA to maintain and/or enhance groundwater well monitoring programs (e.g., GOA well database, groundwater observation well network).	Action: Undertake trend analysis o existing well information to unders temporal changes in groundwater quality and supply within the Sturg River watershed. Action: Encourage the province to undertake groundwater studies at watershed and sub-watershed scal providing relevant maps and tools municipalities for land managemer planning and decision-making.

Goals	Strategies	Short Term Actions (2020 – 2022)	Longer Term Actions (as time a resources permit)
	Strategy 2.2.2. Manage land use development such that key groundwater recharge and discharge areas are not impaired.	Action: Educate municipal staff, including planners, about potential groundwater contamination risks.	Action: Identify key recharge and discharge areas and areas at risk o contamination and use provincial (the Alberta Wetland Policy) and municipal tools (e.g., map overlays environmental reserve, aquifer sig to protect such areas as they are identified. Action: If/where required, under th North Saskatchewan Regional Plan develop Groundwater Managemer Frameworks that protect well heac artesian flow areas, important rech and discharge areas, and and aquif and prevents contamination, and t cumulative effects of development groundwater quantity and quality.
Outcome 3. Aquatic ecosystems, including our rivers, lakes, wetlands and other water bodies, are healthy.			
3.1. Water quality in the Sturgeon watershed is improved. Potential Implementers: SRWA, NSWA,	Strategy 3.1.1. Improve understanding of the health and resiliency of the Sturgeon River watershed by monitoring, evaluating and reporting on water quality and other aspects of aquatic ecosystem health.	Action: Use both technical and traditional knowledge to inform the selection of a suite of indicators (e.g., fish communities, benthic invertebrates, water quality parameters) to monitor the aquatic ecosystem health of the Sturgeon River watershed including the mainstem, priority tributaries and key lakes.	Action: Periodically assess indicato information collected and use this assessment to publicly report on th state of the Sturgeon River watersh every five years.

Goals	Strategies	Short Term Actions (2020 – 2022)	Longer Term Actions (as time a resources permit)
municipalities, stewardships groups, landowners, conservation organizations	Strategy 3.1.2. Identify and reduce point and non-point sources of nutrient and contaminant loading in the Sturgeon watershed.	Action: Ensure awareness and if required, enforcement of existing federal, provincial and municipal regulations such as the Water Act, Public Lands Act, Environmental Protection and Enhancement Act, Agricultural Operational Practices Act, municipal bylaws, etc.	Action: Reduce contaminant loading point sources by improving waste wa management and centralizing sewag lagoon systems.
		Action: Reduce sediment and salt loading from roads by promoting transportation and roads BMPs such as Alberta Transportation and Transportation Association of Canada Guidelines and federal required Salt Management Plans and snow facilities melt water best practices.	Action: Reduce nutrient loading from non-point sources by working with r residents, businesses and agricultu producers to promote beneficial practices and reduce fertilizer and pesticide use near water bodies.
		Action: If needed, incorporate more stringent guidance on setbacks, as promoted by *Stepping Back from the Water*, into bylaws.	Action: Reduce nutrient loading from urban non-point sources by improvir stormwater management, addressir increased flows created by development, incorporating Low In Development (LID) principles and promoting educational programs.
3.2. Aquatic ecosystems in the Sturgeon watershed are healthy. Potential Implementers: SRWA, NSWA, AEP, ACA	3.2.1. Improve our knowledge about the current state of aquatic ecosystem health in the Sturgeon River watershed.	Action: Seek funding to establish more continuous flow gauging stations, particularly at lake outflows to improve lake water balance calculations.	Action: Seek research partnerships study cumulative effects on aquati ecosystem health and its compone including water quality and quantit Action: Conduct an ecosystem valu of the Sturgeon River watershed (considering ecological services, wa supply and regulation, climate regulation, social and recreational values, etc.) to inform local govern planning and development.

Goals	Strategies	Short Term Actions (2020 – 2022)	Longer Term Actions (as time a resources permit)
	3.2.2. Improve aquatic health by developing and implementing wetland and riparian area protection and restoration strategies.	Action: Improve the public availability and use of common wetland and riparian management tools (e.g., education programs, incentive programs, land reserves, restoration programs).	Action: Complete a drained and ex wetland inventory for the watersh (Parkland County portion has been done).
		Action: Develop wetland, riparian and flood plain conservation and restoration goals and targets and advocate for their inclusion in municipal planning documents, as they are developed and renewed.	Action: Support the work of land managers/stewardship programs t protect/restore riparian buffers alc wetlands, lakes and creeks of the Sturgeon River watershed.
	Strategy 3.2.3. Improve the fisheries resource.	Action: Conserve priority fish habitat (areas known to be well oxygenated with good flows) for key fish species and/or life stages.	Action: Improve fish habitat where conditions (e.g., dissolved oxygen, flc known to be poor and where such conditions have led to fish kills in the
	Strategy 3.2.4. Prevent the occurrence and/or spread of aquatic invasive species.	Action: Work with invasive species organizations to educate residents and visitors about what they can do to minimize the introduction and spread of invasive species.	Action: Conduct surveys, inventory occurrences, and prioritize areas/act prevent, contain, mitigate and where possible eradicate invasive species.
3.3. Lakes and their surrounding watersheds are recognized as a highly valued,	Strategy 3.3.1. Improve knowledge about the state of lakes in the Sturgeon watershed and issues affecting their health.	Action: In conjunction with other 'state of' reporting (see strategy 3.1.1) identify and collect long-term data on indicators of lake health and release in a timely fashion to inform decision-making.	

Goals	Strategies	Short Term Actions (2020 – 2022)	Longer Term Actions (as time a resources permit)
limited resource and managed such that they are healthy for current and future generations. Potential Implementers: SRWA, NSWA, municipalities	Strategy 3.3.2. Educate lake residents and visitors/users about their impacts and what they can do to lessen their footprint.	Action: working with the GOA Respect our Lakes program, ensure the public and elected officials understand lake ecology, have realistic expectations of what a healthy Alberta lake looks like, and know what they can do to reduce their impact.	Action: Engage existing and suppor lake watershed stewardship group stewardship programs and produc (e.g., Nature Alberta's Living by W
	Strategy 3.3.3. Improve lake watershed management by aligning policies and regulations such that land use and recreation do not irreparably harm the lake resource.	Action: Ensure the referral system between government regulators is working and development applications are being reviewed such that the cumulative effects of nutrient and sediment loading is reduced.	Action: Develop land use bylaws ar policies (e.g., pesticide and fertilize bylaws, setback distances, building standards) that are consistent betv municipalities that border a sharec waterbody.
Outcome 4. The Importance of water quantity is recognized and reliable, quality water supplies are available for people, livest economy.			
4.1. Water supply is managed effectively to support aquatic ecosystems, communities and the economy. Potential Implementers: NSWA, SRWA, AEP, EMRB,	4.1.1. Collaborate with the province, academia and others to fill information gaps on the Sturgeon River mainstem and its major tributaries including seasonal instream flow and aquatic health needs, current water use and future demand and supply.	Action: Examine existing data and estimates around domestic entitlements, agricultural registrations, licenced water allocations, actual use/consumption and compare to instream flow needs calculations.	Action: Encourage all licencees to accurately and consistently report water use through the GOA Water Reporting System.
		Action: Explore the most appropriate method of calculating IFNs and calculate IFNs under current and anticipated future conditions. Where required, use the appropriate regulatory tools to limit water withdrawals during low flow periods for the protection of aquatic ecosystem health.	Action: Maintain existing mainsten gauges and seek funding and estab more gauging stations on tributari improve water balance calculation determine long-term trends in lak levels/river flows.

Goals	Strategies	Short Term Actions (2020 – 2022)	Longer Term Actions (as time a resources permit)
AUMA, RMA licencees, producers	4.1.2. Ensure water supply meets future growth and demand.	Action: Identify and promote beneficial practices, incentives and other tools to promote water conservation and reduce water use by agriculture, industry, municipalities and the public.	Action: Ensure the economic value water as well as trade-offs are understood and inform local and regional decision-making.
Outcome 5. Wise land use ensures the cumulative effects of growth and development are mitigated, the land is resilient to cli individuals and communities are well prepared for flood and drought events.			
Goal 5.1. The cumulative effects of land use detrimental to watershed health are understood, considered in decision-making processes, and where possible, addressed. Potential Implementers: SRWA, NSWA, municipalities	Strategy 5.1.1. Protect important areas of existing natural land cover, such as wetlands, riparian areas, key groundwater recharge areas and key habitat and wildlife corridors in the Sturgeon watershed.		Action: Compile existing or commi new maps showing important area natural cover/environmentally significant areas and ensure this da available to municipal planners an decision-makers.
	Strategy 5.1.2. Use land use planning and development processes to ensure built landscapes maximize water capture, infiltration and slow release (through protection and restoration of riparian areas, wetlands and floodplains and through stormwater management best practices).	Action: Promote LEED standards and low impact development (LID) principles that integrate with the environment.	Action: Identify and prioritize area where there is more value from LI where different LID elements are n useful (e.g. enhanced infiltration w less useful in areas dominated by shallow clay sediments). Action: Conduct a study to see wha impacts would be of developing a conservation and protection zone each side of the Sturgeon River wit limited types of industrial develop (e.g., No hazard waste transfer, lar lagoon, refinery, salt yard, any faci handling contaminants of concern (COCs), etc.) allowed within the co

Goals	Strategies	Short Term Actions (2020 – 2022)	Longer Term Actions (as time a resources permit)
	Strategy 5.1.3. Promote a stewardship ethic and increase the adoption of best management practices for agricultural lands and acreages.	Action: Support programs like (but not limited to) ALUS Canada, the Green Acreages Program and Alberta's Environmental Farm Planning.	
5.2 The effects of climate change on the Sturgeon watershed are understood and mitigated. Potential Implementers: SRWA, NSWA, municipalities, AUMA, RMA	Strategy 5.2.1. Build awareness and knowledge about the impacts of climate change on the Sturgeon River watershed.	TBD	
	Strategy 5.2.2. Promote flood/drought preparedness to agriculture, industry, municipalities, Indigenous communities and the public.	TBD	
	Strategy 5.2.3. Promote energy efficiency and other air quality and carbon reduction strategies.	TBD	

Goals	Strategies	Short Term Actions (2020 – 2022)	Longer Term Actions (as time a resources permit)
Outcome 6. Residents and stakeholders support the Sturgeon River Watershed Management Plan and are willing to participat initiatives to improve watershed health.			
6.1. Residents are engaged in watershed management through education, outreach and stewardship opportunities. Potential Implementers: SRWA, NSWA, municipalities, GOA, conservation and stewardship groups	6.1.1. Building on the GOA's water literacy program, develop an education and outreach strategy specific to the Sturgeon watershed and its stakeholders.	Action: Continue to maintain a dedicated SRWA webpage as a central hub for posting SRWMP updates, reports, FAQ sheets, etc. Action: Facilitate regular SRWA forums to report on progress of SRWA SRWMP and / or participate in major municipal events to share information on SRWMP implementation.	Action: Align key messages and de shared materials on key watershec issues (riparian health, lakeshore is wetland loss, water quality, invasiv species, etc.). Action: Provide opportunities for improving understanding of Indige values and traditional knowledge.
	6.1.2. Engage the public through hands-on learning and stewardship activities by supporting the formation and maintenance of stewardship groups such as Big Lake Environmental Support Society (BLESS), Lake Isle and Lac Ste. Anne Water Quality Management Society (LILSA), local Fish and Game Clubs, etc.	Action: Provide financial, technical and other support to BLESS, LILSA, local Fish and Game clubs and other stewardship and conservation groups to carry out education and stewardship activities such as distributing educational materials, hosting workshops, organizing shoreline clean-ups, riparian plantings and invasive plant monitoring, etc.	
	6.1.3. Celebrate and communicate successes.	TBD	

Goals	Strategies	Short Term Actions (2020 – 2022)	Longer Term Actions (as time a resources permit)
6.2: The SRWA is representative, well-attended and effective at using a collaborative approach to implement the SRWMP. Potential Implementers: NSWA, SRWA, municipalities, GOA	6.2.1. Continue to provide a platform for the province, municipalities, Indigenous communities, NGOs, industry and other stakeholders to collaborate on SRWMP implementation through participation on the SRWA Steering and Technical Committees.	Action: Provide support such that the Steering Committee meets a minimum of three times a year to oversee and report on SRWMP implementation.	Action: Encourage Indigenous communities, agriculture and indu participate on the Steering and Technical Committees or their initiatives.
		Action: Provide support such that the Technical Committee meets a minimum of four times a year to address information gaps and technical issues with implementation.	Action: Prepare an annual report o SRWMP implementation progress present it to municipal councils an other interested stakeholders.
		Action: Develop a workplan and budget and apply for municipal and other grant funding to support the work of Steering and Technical Committees.	